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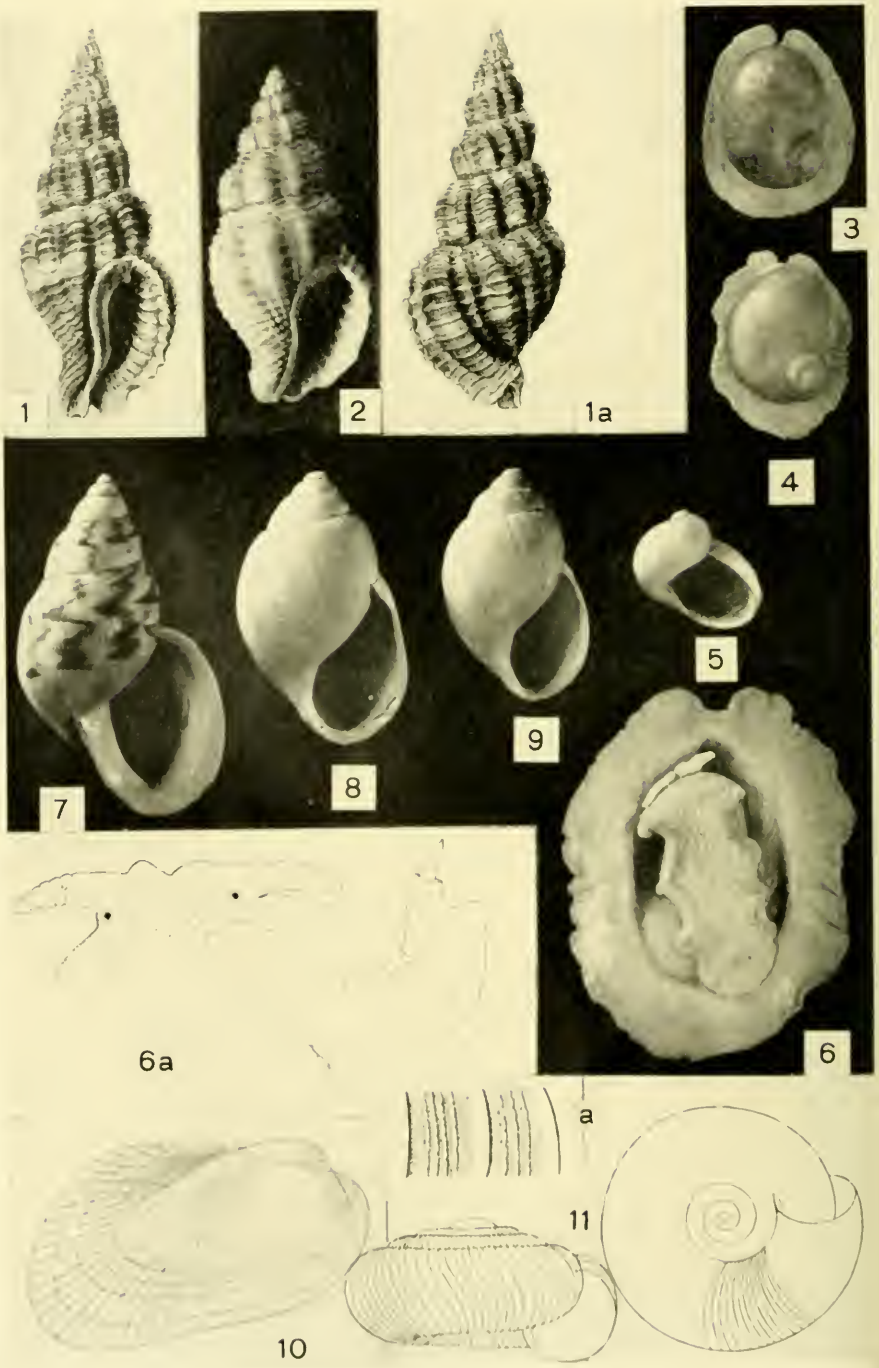
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THE NAUTILUS

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CERTAIN OPERCULATES OF THE COOSA RIVER

By CALVIN GOODRICH

Ten men certainly, possibly three more, collected mollusks in the Coosa River or its tributaries up to the turn of the present century. They ranged from geologists and botanists who picked up such shells as they saw on bars or in drift, to R. E. Call who could measure his catches in bushels. So far as published records are concerned, none of them bothered to tell of the conditions under which the molluscan populations lived, or indeed, the geologists maybe excepted, what the river was like. A. A. Hinkley visited the stream in 1903, and his account provided a few hints as to the nature of the collecting, no more. Herbert H. Smith went down the river in 1904, having previously lived for a while at Wetumpka near the discharge, was on different parts in other years and shortly before his death spent a season on the Georgia headwaters. His experiences were never printed, and what he had to say of them was kept to personal letters and must seem to us now annoyingly casual.

The stream, so offishly treated, had more endemic molluscan genera and species than any other in North America. The colonies often were huge. They tended to vary not simply as between sets of rapids, but sometimes on the same group. That differing environments affected the exoskeletons of a given species might be said to have advertised itself. It seems likely that some, if not most, of the strange races are wholly gone. For the waters have been backed up behind great dams, miles of reefs are covered and formerly quiet reaches between rapids have been expanded into silt-accumulating lakes. At the foot of the lowermost dam are remains of the old Wetumpka rapids, but I have been told that ten to fifteen feet of water rush over them in the hours that the dynamos are operating. Moreover, upstream

MARINE BIOLOGICAL WOODS HOLE LIBRARY MASS.

sections which once ran clear, Rome to Cedar Bluff for example, are turbid with field wash, even in a dry August, and one gets specimens, if any, by feeling for them.

These memoranda have been gleaned from available Smith correspondence:

Wetumpka—"There is an island half a mile up the river, rocky and intersected with small water-channels, and with numerous back-water pools. One pool is crowded with small species, and it is about the only place in which I have found small ones at all. These mollusks crawl about in a fairly lively way, but I do not think they travel far from their birthplace. I am almost certain that many forms and two whole groups live normally in the middle of the river, only appearing on the shores or in pools or back-water as they are carried there by freshets."

Gadsden, Etowah County—"From Rome to Gadsden we found a constant succession of shoals, either along the shores or forming islands. I found that a recurrence of the same conditions brought the same species."

Riverside, St. Clair County—"At the upper end of Minnesota Bend are limestone rocks and shoals. Following this is a long stretch, 8 or 10 mi., in which the river is lake-like with muddy bottom and low shores. Below Leoto Shoals are reefs of rock extending quite across the river and leaving only a narrow channel. The water makes a strong current wherever it can find a passage."

Higgin's Ferry and Duncan's Riffle, Chilton County—"There are no extensive shoals, but small gravel shoals and some rocky bars. After leaving Higgin's Ferry, there is a stretch of about four miles before we come to Duncan's. From Duncan's is a close succession of shoals to Wetumpka. *Neoplanorbis* was found in very swift water where we had to cling to rocks with one hand while fishing for stones with the other; once I got a dowsing."

Fort William Shoals, Talladega County—"Several reefs cross the river diagonally and on them we made our best hauls." He tells of bagging 150 specimens of *Gyrotoma* in a space twenty yards long. "There was one little pool under a fall which must have yielded a hundred fine ones. You would have laughed to see me sitting in the fall, holding by one hand while I groped

with the other, bringing up three or four at a time. Often they were washed from my fingers, for the current was a caution. Different reefs yielded different shells. Below Peckerwood Shoals and Weduska Shoals is quiet and deep water, and on Weduska one sees a change in the fauna."

Peckerwood Shoals, Talladega County—Describes taking gastropods from stones with which fishermen had anchored their nets in deep water, and finding that they corresponded not with shells of the nearby shallows, but with up-river forms. He speaks of crawling on hands and knees over a reef a furlong long, and in three days finding hardly a dozen specimens.

Cedar Bluff, Cherokee County—"Both the Chattooga and Little rivers near here are normally clear, cold streams. Little River is half as large as the other, more shoaly and more shingly. All the seven or eight species collected in Little River, even 100 yards above the junction, are different from those found in the Chattooga, and not one has been seen in the Coosa."

Center, Cherokee County—"I have worked for three or four days on the lower part of Terrapin Creek. I could work for only a few hours at a time; it was so cold that Mrs. Smith kept a huge fire going for her own comfort and for thawing me out whenever my feet and hands got too numb."

In the pages which follow have been brought together all the known distributional facts in regard to the opercula tes of the Coosa basin, with the exception of the Pleuroceridae, together with such habitat notes that were obtainable. A certain amount of revision of the genera *Somatogyrus* and *Clappia* has been made, largely on the basis of material collected by Smith and left for several years in the Walker collection unexamined.

Viviparus

Viviparus contectoides W. G. Binney. Land and Fresh-Water Shells of North America, part 3, 1865, p. 113. The species occurs over a large part of Georgia and Alabama, commonly in stagnant waters, its colonies large. It is known to the Coosa drainage only by specimens purporting to come from the river at Wetumpka. The collector is unknown. It seems probable that the shells were brought into the Coosa from some nearby pond, swamp or quiet stream.

TULOTOMA

Tulotoma coosaensis (Lea). Trans. Amer. Phil. Soc., 9, 1844, p. 23. The genus is confined to the Coosa and Alabama rivers, and though there is some intrusion in creeks of these main streams it has not been found in the large tributaries, Cahaba and Tombigbee rivers. Excavations made at Moundville, Hale County, Alabama, brought sub-fossil specimens to light, and Mr. T. H. Aldrich, who took part in that work, inferred that the mollusks had been brought by Indians from the nearby Black Warrior River. He did not, however, find examples there that would support the view. Conrad, the first naturalist to remark *Tulotoma*, reported that they occurred in "vast abundance on the masses of calcareous rock, which had fallen from the strata above, into the Alabama River, at Claiborne." A search for specimens at Claiborne six or seven years ago failed to bring living individuals to light. *T. coosaensis* is the smooth upstream form, and so far as known has been collected only in the Coosa River and Cholachee Creek, Wilcox County, of the Alabama.

T. angulata (Lea). Trans. Amer. Phil. Soc., 9, 1844, p. 22. This is apparently restricted to the Coosa River, St. Clair to Elmore County, and such side-streams as Choccolocco and Tallassechatchee creeks, Talladega County; Kelly Creek, St. Clair County, and Waxahatchee Creek, Shelby and Chilton counties, all in Alabama. The shell is to be considered transitional between *T. coosaensis* and the next species.

T. magnifica (Conrad). New F. W. Shells of U. S., 1834, p. 48, pl. 8, fig. 4. "This species," Hinkley wrote, "was nearly always found on the under side of rocks where there was little or no current. They were generally in colonies; it was not uncommon to find 20 or 30 under a single stone a foot square or more." The observation was confirmed by Smith. His collections indicate a distribution in the Coosa from St. Clair to Elmore County, Alabama, and entrance for a short distance into Canoe Creek, St. Clair County, and Waxahatchee Creek, some miles below. The presence of shells in the waste heaps of old Indian villages points to use as food.

Campeloma

Campeloma decisum (Say). Nicholson's Encyclopedia, 3rd ed., pl. 2, fig. 6. Bryant Walker so identified four lots of shells from the Coosa basin, two having been taken in headwaters in Georgia and the other two in creeks of Etowah County, Alabama.

C. lewisii Walker. Nautilus, 28, 1915, p. 126, pl. 5, fig. 3. Easily confused with *C. decisum* and possibly a phase of it. Localities of the Coosa drainage in which the shell has been found are Mill Creek near Dalton, Whitfield County; Telloga Creek, Chattooga County, both being streams of Georgia; Chattooga River, Georgia and Alabama; Little and Big Wills creeks, and Beaver Creek, Etowah County; Kelly and Shoal creeks, St. Clair County; Upper Clear, Peckerwood and Talladega creeks, Talladega County—these streams belonging to Alabama.

C. geniculum (Conrad). New F. W. Shells of U. S., 1834, p. 48, pl. 8, fig. 3. An elevated shell with a sharply shouldered whorl, particularly emphasized in the last one. It is a fairly common *Campeloma* in the coastal plain of Georgia and Alabama, rare in the uplands. Specimens identical with it have been collected in Etowah River, Cartersville, Bartow County, Georgia; a branch of Little River, Cherokee County, and Talladega Creek, Talladega County, Alabama.

C. ponderosum coarctatum (Lea). Proc. Amer. Phil. Soc., 2, 1843, p. 243. This subspecies has been redefined by Walker, Nautilus, 28, 1915, pp. 121–26. This is the common form of the Coosa from streams above Rome, Georgia, to Wetumpka, Elmore County, Alabama, the colonies apparently populous. Collections have been made also in side-streams of Etowah, St. Clair and Talladega counties, Alabama, but so near the discharges that probably all should be considered riverine mollusks.

Lioplax

Lioplax cyclostomatiformis (Lea). Proc. Amer. Phil. Soc., 2, 1841, p. 83. As in *L. subcarinata* (Say), the operculum of the embryo is spiral, but growth alters to concentric in the free-living stage. Distribution so far as known is restricted to the Alabama River system. In the Coosa proper it occurs from St. Clair County to Wetumpka, Elmore County, Alabama. Curiously,

though found in small streams about Rome, Georgia, it does not appear in such waters again above Etowah, St. Clair and Talladega counties, Alabama. This may be due to preference in habitat, which is muddy shallows of slow-moving water.

Valvata

Valvata bicarinata Lea. Proc. Amer. Phil. Soc., 2, 1841, p. 83. The common *Valvata* of the coastal plain, but scattered southern colonies are come upon now and then in the Piedmont region. It has been found in small numbers in the Coosa River bordering Cherokee, St. Clair, Shelby, Talladega, Coosa and Chilton counties, Alabama, and also in a few side-streams of the same area.

V. tricarinata (Say). Jour. Acad. Nat. Sci., 1, 1817, p. 13. The only known locality for the species in the Coosa River is Leoto Shoals, St. Clair County, Alabama. It has not been seen in tributary streams.

Amnicola

Amnicola limosa (Say). Jour. Acad. Nat. Sci., 1, 1817, p. 125. Collected in the Coosa at Ten Island Shoals, St. Clair County, and Upper Clear Creek, Talladega County, Alabama.

A. augustina Pilsbry. Nautilus, 17, 1904, p. 113. The species was first observed in a small stream near St. Augustine, Florida, but has since been collected in several other places in southeastern United States. H. H. Smith found it in the Coosa River, Shelby County, Alabama, and in Upper Clear Creek, Talladega County. The river habitat he described as "quiet water along shore on cattails and rotting leaves"; that of the creek, "duckweed growing on mud."

A. sanctijohannis Pilsbry. Nautilus, 13, 1899, p. 20. Known from only one locality in the Coosa basin, Beaver Creek, Etowah County, Alabama.

A. floridana Frauenfeld. Verh. der k.k. zool.-bot. Ges. Wien, 1863, p. 1028. Collected by Smith in Upper Clear Creek, Talladega County, Alabama, near the mouth, "on decaying leaves in quiet water." The species was among mollusks which T. H. Aldrich sifted from marl of Sumter County, in the Tombigbee drainage.

A. olivacea Pilsbry. Nautilus, 8, 1895, p. 118. The species is somewhat common in streams and springs in and about Huntsville, Madison County, Alabama, drained by the Tennessee River. Specimens taken by Smith in the Coosa, Minnesota Bend, Etowah County, Alabama, have been identified as *olivacea*.

Somatogyrus

This genus illustrates the faunal cleavage between the Mollusca of the Alabama River system and the systems to the north and east of it. Two species of eleven that are known to be in the Coosa are also in the Tennessee, and two only. None, so far as known, is in both the Coosa and the Chattahoochee. Further, in contrast to the several Coosa River species, there are only four in the Cahaba River and three in the Black Warrior. It would seem, too, that the Coosa populations are enormously large in comparison with the others. Where habitat was noted by Hinkley and Smith, it was the under sides of stones most frequently. In the case of *S. nanus*, Hinkley found that it "literally covered the rock-bed of the stream in favorable situations." In Tallasseehatchee Creek, Smith took great numbers of specimens from among water weeds. Moderately fast water to strong current was occupied as a rule, but Hinkley found *S. obtusus* "among the drift in a stagnant pool"; Smith, on the other hand, took the same species in swift water. Locality data make it clear that unlike the case of *Goniobasis* and *Gyrotoma* of the Coosa, restricted endemism is almost absent in *Somatogyrus*.

In this review, material that Smith collected in the Coosa bordering Talladega County, Alabama, and in creeks of St. Clair, Talladega and Shelby counties, was available for study in unsorted condition. This made it possible to trace development from infancy to maturity uninfluenced by separations in the field that might have been hurried and perfunctory. Sorting brought out the fact that several species differed as to their extraneous coloration and the superficial deposits on the shells, giving the impression that though mollusks may have been collected in quite a small area a certain amount of selection of habitat went on as between the species. Thus, *S. hinkleyi* was almost always black; *S. coosaensis* gray and with minute protuberances

such as algae perhaps formed. On the basis of shell characters, the species fall into four groups.

Group of *Somatogyrus coosaensis*

Somatogyrus coosaensis Walker. Nautilus, 17, 1904, pp. 137–38, pl. 5, figs. 6, 7. The range in the Coosa is from two miles above Slackland, Cherokee County, Alabama, to Wetumpka, Elmore County. It was taken plentifully in creeks of St. Clair, Shelby and Talladega counties, but appears to have been a rarity in Waxahatchee Creek, farther downstream. Specimens in one or two of the side-streams are slightly more elevated than riverine shells. A synonym is *S. aldrichi* Walker, Nautilus, 19, 1906, pp. 114–15, pl. 5, fig. 9. Its sole distinction is a keel below the periphery that in Walker's type is "continuous about two-thirds around the whorl." But the keel varies from a mere, blunt angulation to a sharp, continuous carina. Association was always with *coosaensis*. The keel possibly is formed while the shell substance is fresh and plastic, and brought about by the pressure of the animal on the stones to which it clings.

S. crassus Walker. Nautilus, 17, 1904, p. 138, pl. 5, figs. 11, 12. Found in the rapids of Elmore, Chilton and Coosa counties, and unknown to side-streams. It is the dominant species of the group at Wetumpka, at the Falls Line.

S. nanus Walker. Nautilus, 17, 1904, p. 136, pl. 5, fig. 4. Hinkley found the species in the "open" and "showing very plainly through the clear water, but owing to the swift current it was difficult and tedious collecting them." The uppermost river locality is Ten-Acre Islands, Etowah County, Alabama; the lowermost, Wetumpka. It has been seen in only one creek, Weogufka, of Coosa County.

S. pygmaeus Walker. Nautilus, 22, 1909, p. 88, pl. 5, fig. 3. All the known specimens were taken by Smith in the Coosa River, The Bar, Chilton County, Alabama.

Group of *Somatogyrus hinkleyi*

S. hinkleyi Walker. Nautilus, 17, 1904, p. 138, pl. 8, figs. 1, 2; redescribed, Nautilus, 22, 1909, p. 87, pl. 6, figs. 8, 9. The adolescent shouldering and basal angulation vary as between colo-

nies, and it would appear that the form assumed by the last whorl of half-grown individuals, angular or evenly rounded, is correlated with environmental conditions. A Smith label remarked habitat to be "gravel shoals, on the lower sides of stones, in the current." Distribution in the Coosa is from Cherokee County, Alabama, to Wetumpka. The species occurs in many of the tributary streams.

S. decipiens Walker. Nautilus, 22, 1909, p. 86, pl. 6, figs. 10, 11. The type locality is Coosa River, The Bar, Chilton County, Alabama. For the most part, the colonies are on rapids of the Chilton-Coosa reaches. It is rare on Fort William shoals, farther up-stream and seemingly is absent at Wetumpka.

S. constrictus Walker. Nautilus, 17, 1904, pp. 135–36, pl. 8, fig. 3. Specimens, few in number, were found by Hinkley in the Coosa five miles above Wetumpka, and also at Wilsonville, Shelby County. He wrote that occurrence was "on the under side of the rocks associated with *S. coosaensis* and *S. hinkleyi*, very seldom more than one on the same rock." Smith did not collect it. The species gives the impression of being depauperate.

Group of *Somatogyrus aureus*

S. aureus Tryon. Amer. Jour. Conchol., 1, 1865, p. 220, pl. 22, fig. 9. In the Coosa River bordering St. Clair and Talladega counties, Alabama. Shells referable to the species have been taken in Kelly's Creek, St. Clair County, not far from the mouth, and in the upper part of Yellowleaf Creek, Shelby County. Specimens with shortened spires, a wide umbilicus and the general shape of *S. coosaensis* were collected by Smith on Fort William shoals. They occurred with normal forms of *S. aureus*.

S. georgianus Walker. Nautilus, 17, 1904, p. 139, pl. 5, fig. 13. The type locality is Chattooga River, Chattooga County, Georgia, but the species is more a creek inhabitant than a riverine form, being especially common in small streams around Rome, Georgia, and occurring in several other Coosa tributaries as far to the south as Talladega County, Alabama. Specimens from Tallasseehatchee Creek of this county are remarkably large. Smith found the mollusk in the Coosa at two localities, both in St. Clair County.

S. hendersoni Walker. Nautilus, 22, 1909, pp. 87–88, pl. 6, fig. 2. This is one of Smith's findings in the Coosa-Chilton counties rapids of the river. He collected it in four stations there, and it is unknown from any other part of the Coosa.

Group of *Somatogyrus obtusus*

S. obtusus Walker. Nautilus, 17, 1904, p. 138, pl. 5, fig. 10. This is the only member of the group in the Coosa basin. In shell characters, it has no affinities closer than a form taken in Arkansas. Specimens from any one locality of the river are much like those from other stations. Smith collected more than a thousand examples in Upper Clear Creek, Talladega County, Alabama, and others in several neighboring side-streams. The range in the river itself is apparently from Center Landing, Cherokee County, to the Coosa-Chilton counties shoals.

Clappia

Clappia umbilicata (Walker). Nautilus, 17, 1904, p. 137, pl. 5, fig. 5. Synonym, *Clappia clappi* Walker, Nautilus, 22, 1909, p. 89, pl. 8, figs. 1, 4 and 7. The shell was collected by Hinkley in small numbers at Wetumpka, Elmore County, and a single one at Fort William shoals, Talladega County. When Smith's much larger collections reached Walker, he had seemingly forgotten the shell he named *Somatogyrus umbilicatus*, wrote a new description and on the basis of the distinctive radula established a new genus. The types of the two species are so indistinguishable that, once confused, it would be impossible to restore them with any confidence to their proper vials. In a depressed form, the umbilicus is round, wide and deep, but as always it was associated with the higher spired shells it must be thought to be only an individual variation. The mollusk occurs in the Coosa River from a mile above Slackland, Cherokee County, Alabama (one specimen), to Wetumpka. Judging by Smith's material, the largest colony is on Fort William shoals. Only one small-stream locality is known; this is a branch in Elmore County.

PULMONATES OF THE COOSA RIVER

By CALVIN GOODRICH

Seventeen definitely defined species of these gastropods are known to occur in the Coosa River Basin. At least three others could probably be found either as permanent or transient occupants of pools, swamps and small streams. Except in the instance of the Ancylidae, the pulmonates seem to be poorly represented. That is, the colonies are usually small, some of them wide apart from one another, the individuals rather puny than robust. As against these adverse circumstances is the occurence of two endemic genera which have developed in the heavy currents of the Coosa and have not spread even to rapid side-streams. A. A. Hinkley was the first collector to pay much attention to the pulmonates of the drainage, Herbert H. Smith the only one to pursue the quest for them from station to station.

Lymnaea

Lymnaea columella Say. Jour. Acad. Nat. Sci., 1, 1817, p. 14. As a rule, the species lives in stagnant water and feeds on algae or other organisms establishing themselves on lily pads and cat-tail stems. Smith found it, however, in the Coosa River at Fort William Shoals, Talladega County, the Narrows, Shelby County, and Duncan's Riffle, Chilton County, Alabama, where the current has been described as of decided force. The shell, possibly of sporadic occurence, has been taken from Georgia headwaters to the discharge near Wetumpka, mostly in side-streams. F. C. Baker speaks of a southern form "which is considerably smaller than the typical *columella,* averaging about two-thirds the size of the more northern forms." Coosa basin specimens meet this description.

L. humilis Say. Jour. Acad. Nat. Sci., 2, 1822, p. 378. The Coosa forms are puzzling, some of the specimens being *humilis* typical and others matching the northern subspecies *modicella.* The two aspects in instances are in the same colonies. Distribution is from Floyd County, Georgia, to Chilton County, Alabama. Smith found the shell in six localities of the Coosa proper and in three small tributaries.

Helisoma

Helisoma antrosum (Conrad). Amer. Jour. Sci., 25, 1834, p. 343. (= *P.anceps* Menke.) Records for the Coosa drainage are from a branch of Dyke's Creek, Floyd County, Georgia, to the main river in St. Clair County, Alabama, and Tallasseehatchee Creek, Talladega County.

H. trivolvis (Say). Nicholson's Encyl., 1817, pl. 2, fig. 2. It is hard to believe that Silver Creek, Rome, Floyd County, Georgia, is the sole location for this species in the basin, but it happens to be the only record I can discover.

Gyraulus

Gyraulus parvus (Say). Nicholson's Encyl., 1817, pl. 1, fig. 5. The mollusk was taken by Smith in Upper Clear Creek, Talladega County, Alabama, and appears to have been seen nowhere else in the Coosa basin. This doubtless has been because of its small size and not on account of actual rarity.

Menetus

Menetus alabamensis (Pilsbry). Nautilus, 8, 1895, pp. 114–15. Originally one of the discoveries of H. E. Sargent at Woodville, Alabama, in the Tennessee River drainage. It proved to be a common finding of Smith in the Coosa basin from sidestreams of Floyd County, Georgia, to creeks of Elmore County, Alabama; somewhat more rare in the main river from Rome to the Alabama, Chilton County. His label for Talladega Creek shells reads "sifted from drift and leaves" and for lots of the Upper Clear Creek, "on duck weed growing in mud." Hinkley's citation of *Planorbis dilatatus* Gould, Coosa River, Farmer and Wetumpka, refers to this species.

Planorbula

Planorbula wheatleyi (Lea). Proc. Acad. Nat. Sci., 10, 1868, p. 41. The type locality is Cotoma Creek, Montgomery County, Alabama, belonging to the Alabama River. Smith found it in streams of three other counties of the same basin. As a snail commonly of stagnant waters, it is most likely also within the

drainage of the Coosa. The teeth of *P. wheatleyi* just behind the aperture are described as six, but available Alabama examples show no more than five, the same as in *P. armigera* (Say).

Physa

Forty-five lots of Physidae of the Coosa basin have been examined, the main differences among them being in the whorl coiling. The whorls in some shells so overlie one another as to give the apex a smoothed, roof-like appearance. In some they are as loosely coiled as in *P. gyrina* of the northern Middle West. The differences are not correlated with habitat, such as river, creek, brook or spring. Judging by the size of the lots, ranging in locality from head waters to Elmore County, Alabama, the riverine colonies have small populations, those of sluggish creeks, quite large ones. This may be why Hinkley, who kept to the main river, missed it altogether so far as his collecting in the basin is concerned. While the material at hand has been assigned to four species, *P. heterostropha* Say, *pomilia* Conrad, *halei* Lea and *crocata* Lea, they are all probably *Physa pomilia* Conrad, Amer. Jour. Sci., 25, 1834, p. 343. The shell was first observed in Randon's Creek, near Claiborne, Monroe County, flowing into the Alabama.

Ferrissia

Ferrissia fusca (C. B. Adams). Boston Jour. Nat. Hist., 3, 1840, p. 329, pl. 3, fig. 17. The one known locality in the area is Coosa River, Weduska Shoals, Shelby County, Alabama.

F. parallela (Haldeman). Monog. Limniades, pt. 2, p. 3 of cover, 1846. Collections were made by Smith in Choccoloco Creek, Talladega County, and a small stream of St. Clair County, Alabama.

F. rivularis (Say). Jour. Acad. Nat. Sci., 1, 1819, p. 125. The only record for the Coosa River proper is Fort William Shoals, Talladega County, Alabama. Other known localities are Coldwater Creek, Calhoun County; a small stream of Cherokee County; Yellowleaf Creek, Shelby County, and Tallassee-hatchee Creek, Talladega County, all of Alabama.

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Gundlachia

Gundlachia meekiana Stimpson. Proc. Boston Soc. Nat. Hist., 9, 1863, pp. 249–52. Examples have been found in Jackson and Madison counties, Alabama, and very probably will be discovered some day in the Coosa basin.

Rhodacmaea

Rhodacmaea filosa (Conrad). New Fresh Water Shells of U. S., 1834, p. 57. The species is known to occur in the Coosa River from St. Clair to Coosa County, Alabama; in the Chattooga River, Cherokee County; Waduska Creek, Coosa County, and Waxahatchee Creek, Shelby County, the same state.

R. rhodacme Walker. Nautilus, 31, 1917, pl. 1, figs. 1, 2 and 8. The known distribution in the main river is from Cherokee to Shelby County, Alabama. Collections were made by Smith also in small tributaries from Floyd County, Georgia, to Coosa County, Alabama. Apparently the commonest member of the genus in the basin.

R. gwatkiniana Walker. Nautilus, 31, 1917, p. 7, pl. 1, figs. 4–6. Seemingly rarer than the other two species. It has been taken in the Coosa River from Peckerwood Shoals, Talladega County, to Gilchrist Island, Shelby County, and in Waxahatchee Creek, Shelby County—all Alabama localities.

Neoplanorbis

Neoplanorbis tantillus Pilsbry. Nautilus, 20, 1906, pl. 3, figs. 3–5. Taken by Hinkley in the Coosa River at Wetumpka "on rocks in swift water, generally on the under side; they are so small that collecting them was tedious, though they were abundant in places" (Hinkley). Not reported from any other place.

N. carinatus Walker. Nautilus, 21, 1908, p. 127, pl. 9, figs. 17, 18. "They live on the under sides of stones in the more or less rapid current and in suitable localities are very abundant. Mr. Smith took 50 from one small stone" (Walker). The mollusk, like the other three species of the genus, is confined to the lower Coosa River, being taken in the rapids bordering Chilton and Coosa Counties, Alabama.

N. smithi Walker. Nautilus, 21, 1908, p. 126, pl. 9, figs. 1, 2. "This little species differs from . . . all other known forms of the genus by the entire absence of spiral sculpture, and the elevation of the spire above the level of the body whorl. The animal is black and the shell consequently appears of that color until cleaned" (Walker). Found in a moderate current at Duncan's Riffle and Higgin's Ferry, Chilton County; Butting Ram Shoals, Coosa County.

N. umbilicatus Walker. Nautilus, 21, 1908, p. 126, pl. 9, figs. 3, 4. The preferred habitat is seemingly a strong current. Smith found it in the Coosa at the Bar and Cedar Island, Chilton County.

AMPHIGYRA

Amphigyra alabamensis Pilsbry. Nautilus, 20, 1906, p. 50, pl. 3, figs. 1, 2. One of Hinkley's discoveries, who collected it in the Coosa River at Wetumpka, Elmore County, Alabama. It was taken later by Smith at Higgin's Ferry and Duncan's Riffle, Chilton County, farther upstream.

WEST AMERICAN FIELD SLUGS (DEROCERAS)

BY HENRY A. PILSBRY

As several new names have been given to correspondents interested in Western slugs, it seems best to publish brief definitions in form of a key, as such names might find their way into print by accident, in advance of the publication of full descriptions in Land Mollusks of North America, later in the year.

The essential specific characters are mainly in the reproductive and alimentary tracts, so that these only are considered in the following.

Key to Species of Deroceras

1. Penis containing a stimulator and terminating in a penial gland 2
   Penis without stimulator or terminal gland, the retractor muscle terminal ..... *D. heterura* (A)

2. Penis with a recurved or spiral terminal gland but no other glands 3
   In addition to a terminal penial gland the penis bears below it a gland composed of slender branches.
   D. panormitanum (B)
3. Terminal penial gland with crimped or lobed edges, or branching; rectal caecum present ..... *D. reticulatum* (C)
   Terminal gland plain, curved over or spiral; no rectal caecum 4
4. Spermathecal duct slender 5
   Spermathecal duct very stout, its wall in a section seen to be longitudinally laminate internally ..... *D. hesperium* (D)
5. Upper part of penis (above the stimulator sac) having two pilasters internally ..... *D. gracile* (E)
   Upper part of penis nearly filled by one large pilaster.
   D. monentolophus (F)

NOTES.—(A) *D. heterura* n. sp., type 115226 ANSP. from Sawyer Peak, Black Range, N. M. The common slug in the Black and Mogollon Ranges.

(B) *D. panormitanum* (Lessona & Pollonera). The long-necked slug is a Mediterranean immigrant, common around San Francisco Bay; known in California as *D. laeve* (Müller),—a very different species.

(C) *"Limax" agrestis* L., as anatomically defined by Leidy = *Agriolimax reticulatus* (Müll.) of Luther. A widely spread immigrant from Europe.

(D) *Deroceras hesperium* n. sp., type 112516 ANSP. from Oswego, Oregon.

(E) *D. gracile* (Rafinesque), *L. campestris* Binney. Occurs from Alaska to San Diego Co., and in Mexico.

(F) *Deroceras monentolophus* n. sp., type 180659 ANSP. from Carbon Canyon, Orange Co., Cal. (W. O. Gregg).

D. gracile and *D. monentolophus* pass through a female stage before male end organs are developed, as in the European *D. laeve* (Müll.). I have not observed this in the other species, though many examples of each have been dissected.

A NEW MODIOLARIA FROM FLORIDA

BY R. A. MCLEAN AND JEANNE SCHWENGEL

MODOLARIA SKOMMA new species. Plate 1, fig. 10.

This delicate, minute shell is translucent, transversely elongate sub-oval, with irregularly spaced concentric wrinkles. The radi-

ating ribs begin posterior to the umbo, and extend slightly over the most prominent part of the shell. These ribs form subnodules where they cross the concentric wrinkles posterior to the prominent ridge, and give a crenate margin to the posterior curve of the shell. The anterior margin is also crenate, but has no radiating ribs. The umbones are prominent, rising above the hinge margin. Epidermis golden brown, with hair-like processes posteriorly. The inside is very smooth and shiny. Hinge and basal margins without crenations. Length 5 mm., breadth 3 mm., thickness 4 mm.

This shell was dredged in 70 fathoms off Lantana, Florida, by Thomas L. McGinty. It is somewhat smaller and less inflated than *Modiolaria lateralis* Say though the general appearance is quite similar. The anterior margin slopes back more sharply and the posterior margin is more produced, giving the shell more transverse length, proportionately. Also, radiating ribs are lacking anterior to the umbones.

A NEW FLORIDIAN LAMELLARIA

By JEANNE SCHWENGEL

Lamellaria koto new species. Plate 1, figs. 3–6, 6a.

Shell naticoid, thin, transparent, with a slight milky cloudiness, covered with a delicate, membranous periostraeum, which is smooth and highly iridescent. There are about 3¼ whorls, of which the first 1¼ may be counted nuclear. This nucleus is minute, flat and smooth, followed by abruptly larger, convex whorls. Suture deeply impressed. Aperture broad-ovate, about ¾ the size of the shell. Columella arcuate, thinly calloused, spirally gyrate, allowing a view to the apex from the base of the shell. Seulpture of very strong, uneven incremental wrinkles.

Height 16.4 mm., length 18 mm.

This Lamellaria was collected by Alfred S. Koto, for whom it is named. It was found on tide flats, near Braidenton Beach, Florida, clinging to eel grass, only accessible at the extremely low tides at the change of the moon. Great care had to be taken in collecting and in cleaning, as the shell is extremely fragile and is almost membranous at the lip. This collecting was done from January 11th to February 23rd, 1944, but after that date the

shells seemed to have entirely disappeared, though all the flats were carefully gone over, not a single specimen being found.

This new Lamellaria is similar in shape to *Marsenina globosa* Perry and *Lamellaria leucosphaera* Schwengel, but is slightly larger than either in all measurements, the body whorl much less globose and the aperture comparatively larger. Also the spire is higher, the sutures more deeply impressed, giving each whorl a more rounded appearance. The male animal (Figs. 4–6a) is milky white and the female (Fig. 3) a dull grey in the single alcoholic specimen of each examined.

ANNUAL FLUCTUATION OF ABUNDANCE OF SOME MARINE MOLLUSKS

By RALPH W. DEXTER

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An observation within the common experience of students and collectors of mollusks is that of observing pronounced changes in the abundance of certain species in a particular locality from time to time. Molluscan populations fluctuate in numbers because of the interaction of a multitude of ecological factors. Many changes are difficult to detect because the number of samples required annually would be very large if valid conclusions are to be drawn. Some fluctuations, however, are noticeable upon ordinary observation or upon examination of a limited number of quantitative samples.

A number of investigators have reported changes in the abundance of certain marine mollusks observed over varying periods of time. Such information is usually fragmentary, is widely scattered in the literature, and often is mentioned in only a casual manner in reports devoted to other topics. Very few studies have been published on continuous observations of the size of particular molluscan populations over a period of years. Some information on the subject is to be found in the following references: Presbrey 1913; Allee 1919, 1923; Blegvad 1929; Caullery 1929; Hagmeier 1930; Orton and Lewis 1931; New-

combe 1936; Stauffer 1937; MacGinitie 1939; Dreyer and Castle 1941; and Jacobson 1943.

In the course of studying the marine communities of a tidal inlet (Annisquam River) at Cape Ann, Massachusetts, during the summers of 1933–37, a number of species of common mollusks were observed to fluctuate in their annual abundance to a striking degree. Several others fluctuated to such an extent that the changes could be detected from a limited number of samples. Those species are discussed in this paper. Purely local changes on a restricted shoreline are not considered in that they are too common to be of significance and would be too small a sample to be representative of the whole population. In each of the cases reported here, the fluctuations apply to the mollusks of the entire inlet (a strait) and its shores, which have a length of approximately four land miles. (See Dexter, 1942, for a complete list of the Mollusca collected in this survey.) In a few instances we know of at least some of the factors which are responsible for the sudden and pronounced changes observed. Human agencies have effected certain changes—some positive and some negative—in the populations of mollusks of commercial importance. Clam digging by the clammers and the management of clams, mussels, and related marine life by the State Bureau of Marine Fisheries have been very instrumental in bringing this about. Also, the disappearance of the eel-grass *Zostera marina*, severe winter weather, and the fluctuations of predators are all known to have influenced certain populations of mollusks. Some species seemed to be undergoing a regular cycle of abundance, although this study was not carried on long enough to make possible observations of any complete cycle.

The present study was conducted at twenty-four field stations, most of which were visited every year. In addition, observations were made over the entire inlet throughout five consecutive summers. In many cases quantitative samples were made at particular stations on the same date for several consecutive years. Dredging studies were begun in the season of 1934. Brief visits were made in the summers of 1938 and 1940 for further study and collection of specimens. An account of the observations on the annuation of molluscan populations follows.

MARINE BIOLOGICAL LABORATORY WOODS HOLE LIBRARY MASS.

Melampus bidentatus Say. In 1933 this snail was found in small clusters in the *Spartina patens* marshes of Little River. Abundant shells found in sea wrack at many places indicated that there had been a great abundance of this species at an earlier date. In 1935 it was found living more widely distributed over the marshes of the inlet. It had increased in abundance to as many as 29 in a 100 square-inch quadrat. The following years it was found to be not quite so abundant. It had, however, remained widely distributed in large numbers in the marshes.

Polinices heros (Say). In 1933 most of the collections of the sand collar snail were empty shells, which were very numerous and widely distributed. Living snails were observed at only three stations. Each subsequent year, however, they were collected more often and became very common by 1937. That year this species was taken not only on all shores with sediments, but in nearly every dredge haul made in the inlet. As many as 12 were taken in a dredge haul at one time. The virtual elimination of the green crab *Carcinides maenas* in the winter of 1933–34 by the Massachusetts State Bureau of Marine Fisheries and by the unusually severe weather of that winter may be partly responsible for the increase of *P. heros* and some other marine mollusks during the ensuing years. The green crab did not return in significant numbers during the remainder of this study. It did gradually become reëstablished by the spring of 1937, but was practically extirpated again by the Bureau of Marine Fisheries.

Littorina saxatilis Olivi. This species was observed to undergo a most remarkable and sudden change in abundance during the five years of this study. In 1933 no living specimens could be found although many shells collected in the sea wrack indicated an earlier population of considerable size. In the season of 1934 less than a dozen living specimens were collected on the rocks and seaweeds at two locations. These were the only specimens found in the season's collecting. In the summer of 1935, however, *L. saxatilis* was present in vast quantities everywhere—on rocks, mud flats, bars, marshes. It was collected on all shores and at all levels between the tide lines. In many instances it was out of its normal habitat. On some shores one could not step anywhere without crushing quantities of this snail. This

year (1935) it was more abundant than *L. litorea*, the periwinkle, which previously was the most abundant snail in the inlet. In 1936 *L. saxatilis* was again found in great quantities on nearly all shores, but it was restricted to the higher tide levels, and for the most part only on solid surfaces, such as rocks, the blades of thatch grass, and on solid marsh banks. At such places, however, the concentration was even greater than during the preceding year. An average of 2 per square inch could be found over extensive areas. By the summer of 1937, the population had declined somewhat in abundance to about the level of that of 1935, but it remained restricted to the higher tidal levels, chiefly near the mean-high-water line.

Littorina obtusata L. In 1933 the seaweed snail was fairly numerous on all of the rocky shores. The following year it was more common, becoming as abundant as *L. litorea* on many shores. By 1935 it was more abundant than *L. litorea* in some places. In favorable localities *L. obtusata* was collected at the rate of 2 per square inch. During the next two years it was not so abundant, although it often averaged one for every 4 square inches.

Lacuna vincta (Montagu). This snail was commonly dredged from the channel of the inlet in 1934. Dozens of specimens were collected. The following year only one specimen was taken while dredging the inlet, although the species remained common in the dredge hauls taken from Ipswich Bay. In 1936 half a dozen individuals were captured, while nineteen were dredged from the inlet the next year. In 1940 dredging indicated that this species was maintaining its numbers, if not increasing somewhat. It is believed that this species declined with the disappearance of the eel-grass *Zostera marina* in 1931–32 on which it formerly lived. Since then, this snail has been largely confined to the brown algae, especially Laminaria spp.

Thais lapillus (L.) Very few living specimens of the rock snail were found in 1933 and these were for the most part at the extremities of the inlet on the shores of Gloucester Harbor and Ipswich Bay. Many empty shells along the shores of the inlet gave evidence of there having been a larger population in the past. The writer remembered making observations to this same effect in years preceding this study. In 1934 this species began

to increase in number in the inlet. The increase continued in 1935 to a noticeable degree. Many young snails were collected that year and often 6 specimens could be collected within a 100 square inch quadrat. The population increased further in 1936, so that as many as 25 were collected in a similar quadrat. By 1937 this species was once again an abundant snail of the region and widely distributed. By 1940 it was as common as ever observed by the writer in this locality.

Nassa obsoleta (Say). In 1933 this mud snail was found at only three stations, but at two of these it was quite common. The following year it was discovered in similar abundance at three additional stations. In 1935 the spread continued into new areas and became more extensive at the old locations. At this time as many as 15 per 100 square inches were collected. By 1937 this species was quite generally distributed throughout the inlet, and at places as numerous as it was in 1935.

Mytilus edulis L. The blue mussel was very abundant in 1933 and somewhat more so the following year. In 1935 quantities of the mussels were removed from certain flats by clam men to prevent them from covering up the dwindling clam flats. In 1936 this prolific mollusk began to return in many places and abundant seed mussels were observed. In 1937, however, several thousand bushels of mussels were removed by the State Bureau of Marine Fisheries in its campaign to restore the soft-shell clam *Mya arenaria.* Many of the samples taken that year included only seed mussels. Between 1935 and 1937 fewer specimens were dredged each year. By 1940 most of the former mussel beds which had been noted in this survey were becoming reëstablished in part.

Modiolus demissus (Dillwyn). In 1935 and 1936 many more young clams were found to have seeded-in along the marshes than previously. In 1936 as many as 26, mostly young clams, were counted in a 100 square-inch quadrat.

Macoma balthica (L). During the first year of the survey this species was collected at only three stations, several specimens being found at each. In 1934 it was found at several new places and in greater quantity. The following year six stations were populated with as many as 12 per 100 square inches. In 1936, however, it was much less abundant, no more than 3

collected per 100 square inches; but it remained as widely distributed as before. In 1937 it was still less abundant, no more than 2 being collected within a 100 square-inch quadrat. Possibly the rise and fall of this population can be correlated with the disappearance and later the reëstablishment of *Mya arenaria* with which it competes for space and food.

Ensis directus Conrad. This razor clam was quite numerous in 1933 and was found on many of the mud and sand flats. By 1935 only one or two specimens were collected within a 100 square-inch quadrat, although it remained as widely distributed as in preceding years. In 1936 and 1937 only a few isolated specimens were collected.

Mya arenaria L. In 1933 the soft-shell clam was rapidly disappearing. Contributing causes were probably over-taking of the clams by the clam industry, the presence of many natural enemies, crabs, horseshoe crabs, starfishes, and the like, together with the fact that the eel-grass which served to retard currents and hold back the clam seed had disappeared in 1931–32. *Mya arenaria* was, however, found at fourteen stations although nowhere was it very common. In 1934 the State Bureau of Marine Fisheries planted hundreds of bushels of clam seed in flats north of Cape Ann, and much of the spawn drifted into the Annisquam inlet. As already mentioned, the green crab was removed as a serious predator. *Mya arenaria* became well established. Great quantities of seed clams were found in the flats and large numbers were dredged from the channel. At least some of the increase was probably the result of natural reseeding. In 1935 two distinct size-groups were in evidence—first and second-year groups. They were found in all flats; but they were not dredged as often. In fact, very few were dredged that year or in subsequent years. From 1936 to 1937 the Bureau of Marine Fisheries placed 400 bushels of small seed clams in the flats of the Annisquam inlet. In 1936 the samples taken by the writer included more of the two-year group but fewer of the one-year group than during the previous season. In 1937 *Mya arenaria* was more abundant than at any time observed in the course of this study. As mentioned earlier, the green crab was prevented from returning as a predator, and many flats were cleared of the mussel beds to allow clam seeds to set. In 1940 the soft-shell

clams were found to be abundant on most of the flats examined, but they were still rather small in size. The scarcity of this mollusk in the larger sizes not only eliminated the clam industry in this region for a period of several years, but made an interesting change in the diet of the herring gulls as reported earlier (Dexter 1943).

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NOTES ON WINTER HABITS OF LAND MOLLUSKS AT ITHACA, NEW YORK

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The following observations were made in beech-yellow birch and sycamore woodlands about Ithaca, New York, during November and December 1940. The temperature varied between 40 and 50 degrees Fahrenheit when the writer was in the field. Information concerns the position of the shell in hibernating snails, types of epiphragms, and hibernating habitats of land snails.

Position of the Shell.—Fragmentary evidence is presented which indicates that the land snail species listed below orient themselves at random preparatory to epiphragm preceding winter hibernation. Binney [1] mentions that land mollusks preparatory to hibernation rest with the aperture up. Simpson [2] states that mollusks preparing for hibernation finally rest with the apex of the shell down.

Stenotrema hirsutum	Spire up		8	Spire down		3
Triodopsis albolabris	"	"	1	"	"	4
Triodopsis tridentata	"	"	8	"	"	7
Mesodon thyroidus	"	"	3	"	"	2
Haplotrema concavum	"	"	1	"	"	3
Helicodiscus parallelus	"	"	1	"	"	1
Zonitoides nitidus	"	"	3	"	"	2
Discus patulus	"	"	2	"	"	2
Total			27			24

Types of Epiphragms.—Two species of land snails observed seem to employ atypical means of sealing their apertures preparatory to hibernation. *Succinea ovalis* Say will cement its shell to a leaf, thus successfully blocking the aperture. One individual of this species had an incomplete epiphragm, the center of which was pierced by a perfectly round hole 1 mm. in diam-

[1] Binney, W. G., 1885. A manual of American land shells, Bull. no. 28, U. S. National Museum.

[2] Simpson, G. B., 1901. Anatomy and physiology of Polygra albolabris and Limax maximus and embryology of Limax maximus, Bull. N. Y. State Museum, no. 40, vol. 8.

eter. Two individuals of *Stenotrema hirsutum* (Say) had their apertures plugged with dirt. In studying the epiphragm of this species it was found that it generally covered the very prominent parietal tooth; on occasion the epiphragm terminated behind the parietal tooth.

Two types of aperture covers were found among individuals of *Anguispira alternata* (Say). Two individuals possessed a bubble mucous aperture plug; the other possessed a complete membranous epiphragm.

Species	Complete Epiphragm	Incomplete Epiphragm	No Epiphragm	Dirt Plug	Cemented to Leaf
Triodopsis tridentata	7	..	..	..	..
Triodopsis albolabris	3	..	..	..	..
Triodopsis notata	8	4	..	..	..
Mesodon thyroidus	..	..	1	..	..
Stenotrema hirsutum	8	1	..	2	..
Discus patulus	10	..	1	..	..
Zonitoides nitidus	3	1	..	..	..
Helicodiscus parallelus	1	..	..	..	..
Haplotrema concavum	2	..	..	..	..
Anguispira alternata	3	..	..	..	..
Succinea ovalis	..	1	..	..	6
Totals	45	7	2	2	6

Hibernating Habitats of Land Snails.—The hibernating habitats of land snails in the beech-yellow birch and sycamore woodlands are quite varied. The snails collected in these forest areas during November and December 1940 were: *Triodopsis tridentata* (Say), *T. albolabris* (Say), *T. notata* (Deshayes), *Mesodon thyroidus* (Say), *Stenotrema fraternum* (Say), *Discus patulus* (Deshayes), *Zonitoides nitidus* (Müller), *Helicodiscus parallelus* (Say), *Haplotrema concavum* (Say), *Anguispira alternata* (Say), and *Succinea ovalis* (Say). Of 473 mollusks that were collected only 2 were found burrowed into the soil. These were *Haplotrema concavum* Say; they had dug into a pebbly flood plain to a depth of 1 inch. The typical shelter was beneath humus or logs.

The following hibernating habitats are those from which land snails were commonly collected: 1. Beneath compact beech and

yellow birch or sycamore leaves at depths varying from 2 to 12 inches in the open or beside logs next to the soil; buried to the same depth but with a layer of leaf humus between the snails and the ground. 2. Log crevices in under surfaces of logs 3. In the crevices formed between 2 adjacent logs buried beneath fallen leaves. 4. Directly beneath fallen bark resting on humus. 5. Under rocks on rocky flood plains where logs were lacking. 6. In open areas of flood plains between large rocks closely adjoining each other; oftentimes humus had blown between the rocks covering the snails. 7. Beneath logs and in the cavities of hollow logs.

SHELLS DREDGED IN PANAMA BAY

By MAXWELL SMITH

Phos clarki new species. Plate 1, fig. 2.

Shell elongate but rather broad for the genus; nucleus of 2½ whorls, shining, glass-like; five succeeding whorls, the latter sculptured with nine somewhat elevated ribs which are more particularly angulated at the shoulder nearest the aperture; spiral sculpture consisting of numerous ribs; suture distinct, whorls moderately rounded; outer lip internally lirate, pillar with a groove near its anterior edge, callus well extended upon body and projecting sharply adjacent to axis.

Length 45.5, breadth 21 mm. Aperture length 21 mm.

Dredged in Panama Bay.

Dedicated to Mr. Walter D. Clark of Balboa, Canal Zone, its discoverer. *Phos clarki* differs from *Phos cocosensis* Dall in being a broader and apparently more robust shell, whorls (exclusive of the nuclear) usually five instead of seven, callus more extended upon body-whorl. Futhermore the lirae in the throat of *clarki* are less numerous. *Phos crassus* Hinds is more closely related to the new shell, but has a much longer spire and also differs in the possession of a well defined node projecting near the posterior angle of the aperture. In *P. clarki* instead of the node there are several indistinct, irregularly placed lirae upon the inner wall of the aperture. For comparison we reproduce

the original figures of *P. crassus* Hinds, from Panama. Plate 1, figs. 1, 1*a*.

Cantharus vibex vibex Broderip.

Apparently an uncommon shell in this region. The height of the spire varies considerably. The interior is bluish white. When the epidermis is removed the varices and a portion of the spire are of a golden-brown color. In adults the outer lip is crenulate.

Cantharus vibex marjoriae new subspecies.

Differs from the preceding in the color of the aperture which is golden-yellow upon both walls and gradually merging into the bluish-white interior well inside the shell.

Dedicated to Mrs. Walter D. Clark.

Clathodrillia inaequistriata Li.

The specimens obtained indicate that this is a recent species. When described this species was supposed to have come from the Miocene beds of Panama Bay.

Metula amosi Vanatta.

An adequate series of fresh but not living examples of this interesting species indicates that it attains a larger size and finer color than the holotype suggests.

Terebra cracilenta Li.

The specimens procured agree well with the description and dimensions as given by Pilsbry.

PERUVIAN LAND MOLLUSCA—III

By HENRY A. PILSBRY

The description of Peruvian snails collected by Dr. W. Weyrauch is resumed here.

Megalobulimus (Microborus) incarum new species. Plate 1, figs. 8, 9.

The ovate shell is white (dead), rimate, moderately solid though not thick, with short spire and obtuse apex. First whorl a little turned down at the tip, smooth at first, then with fine, shallow, slightly irregular radial corrugation, which extends to about 1⅔ whorls, where the neanic sculpture of rather coarse but weak, retractively axial, blunt striae begins. These striae or little waves are strongest near the suture, which is slightly crenulated by them, and they weaken rapidly downward. The last whorl has similar uneven ripples of growth, stronger at the suture, which is more or less uneven or crenulated. The aperture is ovate, outer lip a little thickened and very slightly expanded, columellar margin broadly reflected. Columella is strongly concave.

Length 35 mm., diameter 21 mm., length aperture 21.7 mm.; 4¾ whorls. Type. Length 29.8 mm., diameter 18 mm., length aperture 18 mm., paratype.

Huaraz, Peru, 3000–3200 meters (W. Weyrauch). Type and paratype 180677 ANSP.

It has about the size of *M. pachychilus* (Pfr.), but the aperture is larger and there is no spiral striation of the early whorls. It is apparently related to *M. lutescens* (King) and others of that eastern group. Both of the specimens seen are dead shells, having lost any periostraeum they may have had.

Drymaeus eusteirus new species. Plate 1, fig. 7.

The obliquely ovate shell has a funnel-shaped umbilicus, and is rather solid for a *Drymaeus*. White, the last 3 whorls with zigzag axial stripes of brown (burnt umber), which extend from the suture to slightly below the perphery of the last whorl, leaving the base white; at the apex a small dark brown spot. Embryonic whorls with excessively fine and weak sculpture of *Drymaeus* pattern, the following whorls smooth except for faint lines of growth; last two whorls with fine axial corrugation, more or less interrupted or broken into short impressions. The whorls are convex, the last slightly ascending to the aperture, with a strong, blunt keel at the base, a little concave above the keel. The large aperture is white within. Peristome white, broadly expanding and reflected.

Length 54 mm., diameter 27 mm., length aperture with peristome 25.7 mm.; 6½ whorls.

Oxapampa, Peru, 1800 meters. Type 180674 ANSP., collected by Dr. W. Weyrauch.

This fine *Drymaeus* is nearly related to *D. violaceus* (Mousson), of Colombia, but it has a stronger basal keel and is of much stouter figure. The sculpture is somewhat like that of the Bolivian *D. bolivarii* (Orb.).

Sparnotion new subgenus of *Plekocheilus*.

Proposed for *Bulimus hauxwelli* Crosse, from near Pebas, eastern Peru, formerly placed in *Eudolichotis*, which it resembles in shape. The new subgenus is defined by the first four lines of the *Key to species of Eudolichotis* in Manual of Conchology (2), 10: 109.

Radiodiscus andium new species. Figs. 11, a.

The minute shell is umbilicate, the umbilicus contained three times in the diameter, and rather widely opened to the first whorl. Form discoidal, the spire only slightly convex, periphery broadly rounded. Color: light brown or cinnamon colored. Sculpture: first 1½ whorls have minutely granulose, fine, spiral striae; following whorls are radially ribbed, the riblets smooth, separated by wider intervals in which there are microscopic irregularly granulose striae, three or four in each interval, parallel to the riblets. There are about 16 riblets in one mm. at the periphery of last whorl. Aperture lunate. 4⅓ whorls.

Height 1 mm., diameter 1.9 mm., width umbilicus 0.63 mm.

Chancha, near Tarma, Peru, 3400 meters elevation. Type and paratypes 180007 ANSP.

The microscopic granulation or irregular interruption of the interstitial striae, which characterizes this species, can be seen clearly on fresh shells only. Several species described by Philippi in 1856 [1] from Valdivia, Chili, probably belong to this genus, but very little is known of them, and none has been figured. *R. peruvianus* Crawford is larger.

No sculptural details were given by Dr. Haas for the *Radiodiscus* he examined from the Rio Tumbes, northern Peru (Archiv Molluskenk. 65: 272. 1933).

[1] Cf. Pfeiffer, Mon. Hel. Viv. 4: 95–97.

NOTES AND NEWS

Dates of The Nautilus.—Volume 57, no. 1, pp. 1–36, pls. 1–6, was mailed July 23, 1943; no. 2, pp. 37–72, pls. 7 & 8, October 30; no. 3, pp. 73–108, pls. 9 & 10, February 9, 1944; and no. 4, pp. 109–144, i–viii, pl. 11, May 15.—H. B. B.

Helix minima True.—Dr. MacMillan's inference (Nautilus for April, p. 133) that W. G. Binney did not mention *Helix minima* in his *Manual of American Land Shells* is true, but not the whole truth. Binney knew of the species and intended to mention it, but by mistake he printed the name "*Helix minuta* True," on p. 250 of that work.—H. A. P.

A Large Specimen of *Ensis directus* Conrad.—Mr. James Miller has presented us with an exceedingly large specimen of this species which he collected at Plymouth, Mass. This "razor shell" is quite abundant at many localities north of Cape Cod and appears, on the average, to be somewhat larger than those occurring south of the Cape. Gould (1870, Invertebrata of Massachusetts, p. 41) mentions a specimen from Halifax, Nova Scotia, that measured 8 inches in length. Our present specimen is somewhat larger. It measures 228 mm. (9 inches) in length and 38 mm. (1½ inches) in width.—William J. Clench.

Anoma flexuosa (Pfeiffer).—The synonymy of this species stands as follows:

Pupa fusiformis C. B. Adams 1845, Proc. Boston Soc. Nat. Hist. 2, p. 14 (Jamaica); *non* Deshayes 1833; *non* Küster 1845.

Cylindrella maugeri fusiformis C. B. Adams 1851, Contributions to Conchology 9, p. 164.

Cylindrella flexuosa Pfeiffer 1866, Malak. Blätt. 13, p. 88 (Jamaica).

An examination of the types of *Pupa fusiformis* C. B. Adams indicates that this species is the same as *Cylindrella flexuosa* Pfeiffer. It is not a member of the "*splendens*" group, but appears as a divergent stock related directly to the group of *tesselata* C. B. Adams. As the name *fusiformis* is preoccupied, *flexuosa* of Pfeiffer, the only synonym, becomes available.

Adams apparently had but one specimen when his description was written and later added another, a much finer one. The

holotype of *fusiformis* C. B. Adams is M.C.Z. no. 155842, from St. Andrews, Jamaica.—W. J. Clench.

Living Planorbidae Wanted.—Because of the possibility of the introduction of schistosomiasis into this country by troops returning from endemic areas abroad, the National Institute of Health, United States Public Health Service, is carrying on studies to determine whether domestic species of fresh water snails are capable of serving as intermediate hosts for the three species of human schistosomes. In this connection, it is desirable that more species be made available for testing and the cooperation of malacologists is solicited in forwarding live material for establishment of laboratory colonies. The following species are particularly needed at this time:

Drepanotrema cultratum
Helisoma ammon
H. anceps
H. campanulatum
H. conanti
H. corpulentum
H. duryi seminole
H. duryi cudiscus
H. infracarinatum
H. occidentale
H. scalare
H. smithii
H. traskii
Menetus, all species
Planorbula jenksii
P. campestris
P. wheatleyi
Tropicorbis gracilentus
T. havanensis
T. obstructus

Snails should be packed in damp moss or cotton in a mailing container, the metal lid of which should be perforated in several places, and forwarded by air mail special delivery to Doctor W. H. Wright, Chief, Zoology Laboratory, National Institute of Health, Bethesda 14, Maryland. Reimbursement for mailing costs will be made in the form of postage stamps. Cooperation of readers of The Nautilus in this project will be greatly appreciated.

A Stitch in Time.—Through an unfortunate oversight my name as Assistant Curator of Molluscs at the Museum of Comparative Zoology at Harvard, and my activities, were omitted from Mr. W. J. Clench's account of his Department which was published on page 6 of the *News Bulletin* and *Annual Report* of the American Malacological Union for 1943. This oversight has already caused doubts among several of my friends and associates

as to my position and connection with the Department of Molluscs at the Museum.

After ten years of voluntary service devoted to the study of molluscs and the advancement of our knowledge of them at the Museum of Comparative Zoology at Harvard University, Dr. Barbour, Director, placed me in his eternal debt by bestowing upon me the title of Assistant Curator of Molluscs. I am proud of my record at the Museum and deeply cherish my association with it.

In the early spring of 1943 I went into war work at the Massachusetts Institute of Technology to the extent of giving up practically all of my civilian extra-curricular activities. My entire time and energy at present are devoted to oceanographic research for the Navy at the Woods Hole Oceanographic Institution, Woods Hole, Massachusetts. I fully hope and expect to be working again with molluscs when this war terminates.—Henry D. Russell, Ph.D.

PUBLICATIONS RECEIVED

Revision of the Giant West Coast Land Slugs of the Genus Ariolimax Moerch. By Albert R. Mead. Amer. Midland Naturalist, 30, Nov., 1943. This extremely valuable paper clears up the question of why many individuals of these largest native slugs lack copulatory organs, and proves conclusively that the penes are gnawed off after copulation. *Ariolimax dolichophallus* and *A. californicus brachyphallus* are added to the two species previously known. Let us hope that, after the war, the author will continue his great additions to our knowledge of these interesting slugs.

About the only possible criticisms are in regard to trivial details of wording. Novel anatomical terms, even though more descriptive, are confusing, and epiphallus ("ejaculatory duct" plus "apical vas deferens") has become familiar through that long usage, which "penate" never should receive. Also, species names are binomial, and their specific halves look peculiarly lonesome by themselves and especially strange when capitalized. —H. B. B.

Mollusks of the Clearwater Mountains, Idaho. By Allyn G. Smith. Proc. Cal. Acad. Sci. 23: 537–554, one plate. The mollusks reported on were collected by Dr. G. Dallas Hanna and three companions, in course of an expedition from the California Academy of Sciences, in 1941. The 21 species taken include several known before by the original lots only, the ranges of these as well as of other species being extended. A new species, *Allogona lombardii,* is related to *A. ptychophora* (A. D. Br.), but characterized by being large and heavy with sculpture of sinuous ribs. The list is prefaced by some account of the previous conchological work in Idaho of Hemphill, Ashmun, H. B. Baker and the author.—H. A. P.

Pleuroceridae of the Great Basin. By Calvin Goodrich. Occas. Papers Mus. Zool. Univ. Michigan, No. 485. The discovery of two new species of *Goniobasis, G. laurae* and *G. interioris,* in waters of the Great Basin is one of the most surprising finds of recent years. The localities are in small and short streams in Washoe Co., Nevada, and Lassen Co., California. The Lassen County stream, about a quarter mile long, is surmised to be traceable to a lost stream tributary to Pit River. The origin of the still smaller Nevadan colonies is more problematic.—H. A. P.

Catalogue and Revision of the Gastropod Subfamily Typhinae. By Myra Keen. Jour. of Paleontology 18, Jan. 1944. The Typhinae, which have usually been comprised in the single genus *Typhis,* number about 85 species, varying in time from lower Eocene to Recent, about 25 being living species. 13 subgenera are recognized, of which one, *Indotyphis,* is new. They are grouped under the genera *Typhis, Siphonochelus, Lacrityphis* and *Pterotyphis,* this classification being based upon the number of varices and the positions of the tubes relative to them. All of the groups are illustrated by figures of typical species. A phylogeny of the subgenera is suggested. A catalogue of species with bibliographic references concludes this useful study. —H. A. P.

Notes on Freshwater Mollusks of Idaho Formation at Hammett, Idaho. By Teng-Chien Yen. Jour. of Paleont. 18, Jan. 1944. In 1924 Dr. W. H. Dall announced the finding of

several mollusks of Balkan type in Pliocene beds of Owyhee Co., Idaho. The present paper extends our knowledge of this strange Pliocene fauna, containing species of the following genera: *Valvata*, *Pyrgulopsis*, *Amnicola*, *Fluminicola*, *Pilsbryus* (a new genus based upon "*Lithasia*" *antiqua* Gabb, and grouping with *Fluminicola* and *Lithoglyphus*), *Goniobasis*, *Payettia*, *Orygoceras*, two new genera of Planorbidae, *Angulorbis* and *Pliopholyx*, a *Sphaerium* and a small *Pisidium*. In this list, *Angulorbis* appears to be most nearly related to a species of Slavonia, and the two species of *Orygoceras* belong undoubtedly to that very peculiar Balkan genus. *Pliopholyx* is a remarkable snail, with much more produced spire than *Parapholyx*. The other genera are normally American in their relationships. The new species and others of special interest are illustrated by excellent figures.—H. A. P.

Distribution and Variation of the Hawaiian Tree Snail Achatinella apexfulva Dixon, in the Koolau Range, Oahu. By d'Alte A. Welch. Smiths. Misc. Coll. vol. 103, no. 1; 236 pp., maps, and 12 plates. The shells of the typical subgenus of *Achatinella* are so similar structurally that species have been based largely, and subspecies almost wholly, on coloration. The older authors described 53 species of this group. Sykes, 1900 (*Fauna Hawaiiensis*), recognized 17 species and 13 subspecies. Pilsbry, 1914, had 11 species and 23 subspecies; and Welch, 1942, reduces this typical group of *Achatinella* to 6 species, with a very great number of subspecies, no less than 76 in *A. apexfulva* alone, 43 of them being described as new in this work, which is based upon the study of over 11,300 shells.

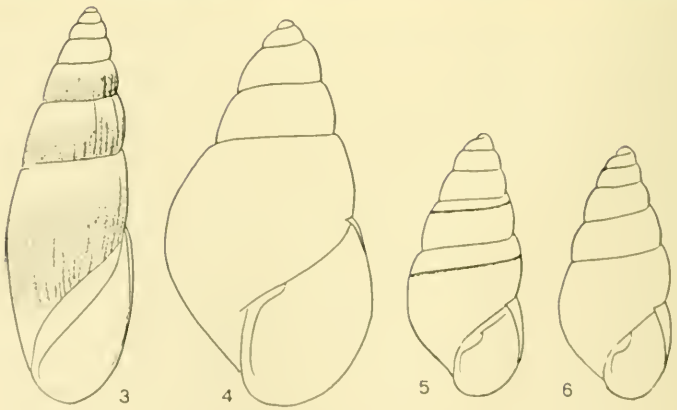
Former work was done mainly with material localized by ridges or valleys, the elevations, where noted, being estimated. Shells collected along a ridge and left together were often from different colonies, at various elevations. The U. S. Geological Survey topographic sheets, not available before 1932, make it possible to localize collecting stations far more exactly, and many more little local races, which Dr. Welch ranks as subspecies, are distinguishable. Many of these represent the smallest steps in racial divergence, and hence are significant in the evolution of species, though the value in taxonomy of such micro-subspecies

is questionable. Collecting in the last thirty years by W. Meinecke and others has brought to light many color-forms unknown when the Pilsbry-Cooke work was published. The recognition and definition of these racial strains required acute discrimination, and their exact localization called for tireless industry. These qualities of the study can be fully appreciated only by those who have worked on this perplexing genus.

As to the factors concerned in the evolution of this complex of forms, the evidence is somewhat conflicting. In a majority of the ridges, size increases with elevation (that is with increase of rainfall and lower temperature), but this is the reverse correlation found by Dr. Welch in *A. mustelina*. No correlation was found for direction of coil. Shells from areas of high rainfall tend to be white, and have banded patterns, those from dryer situations tend to have darker patterns, banded or streaked. The author concludes that "subspeciation of *A. apexfulva* is caused by both the effects of random variation in partly isolated populations, and selective factors of environment."—H. A. P.

Panamic Marine Shells: Synonymy, Nomenclature, Range and Illustrations. By Maxwell Smith. Tropical Photographic Laboratory, Winter Park, Florida. xiii + 127 pp. In the absence of any general manual of the West Mexican and Panamic mollusks, Mr. Smith has compiled this catalogue as a guide to the scattered literature, with figures, references to the original descriptions, localities, and the principal synonyms. The geographic limits of Mazatlan and Panama are set. Many names reported from the region are not present, but doubtless most of the species likely to be found by shore collecting are included. 912 figures, representing a majority of the species listed, are given, most of them copied from other works, but part original; they occupy 53 of the 127 pages. The lithoprint reproductions of many of the figures do scant justice to Mr. Smith's excellent photography, and to the figures copied from other authors.

A new genus of Cymatiidae, Bailya (named in honor of Dr. Joshua L. Baily), is proposed for *B. anomala* (*Triton anomalus* Hinds). The Antillean "Triton" *parvus* C. B. Ad. (*Phos intricatus* Dall), and *Phos roycei* M. Smith, of the Florida Pliocene, are mentioned as additional species of *Bailya*.—H. A. P.



1, 2, *Comptopallium spicei*
3-6 Hawaiian Odostomas

THE NAUTILUS

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SHELL COLLECTING IN THE BAHAMAS

By ALFRED H. PATTERSON

To those of us who live in South Florida and Miami in particular, the sight of a Bahaman boat unloading its cargo is a very familiar one. The cargo nearly always includes high piles of *Strombus gigas* L., *S. costatus* Gmel., *Cassis madagascariensis* Lam., *C. tuberosa* L., *Oliva reticularis* Lam. and *Tellina radiata* L. There will usually be included yellow and purple gorgonians, giant starfishes and delicate coral of various kinds, which find their way to the shell dealers and novelty manufacturers in South Florida.

Often I would watch this unloading in Miami and pore through boxes and bags of mixed shells to find worn specimens of species that were not found frequently in Florida, and had wished several times to be able to collect shells where such as these could be found.

It was in the early part of 1942 that my business took me to Nassau where I had the good fortune to remain almost two years. During this time I had many opportunities to collect shells on several of the islands.

New Providence Island, on which Nassau is located, is one of the smaller of the Bahama group. It lies east of the Great Bahama Bank and separates from it by the Tongue of the Ocean with its profound depths. This accounts for so many deep water specimens showing up on the western tip of the island. There is a sheer drop down to 400 fathoms within a mile offshore, which affords little chance for the collector in that area. But, immediately north of the Island, which extends for a distance of well over 25 miles, is the most easily accessible coral reef I have ever had the pleasure to collect upon. This reef lies from one half to about a mile offshore and there are several keys in it including Hog Island and Athol Island.

There are places near the western end of this reef where, at low tide, one may walk out several hundred yards, waist deep in water, among purple and yellow gorgonians and coral heads up to 10 feet in diameter.

On the yellow gorgonians, upon close inspection, one will see yellow *Simnia acicularis* Lam. feeding upon the polyps, and purple ones on the long purple sea plumes. It is on these gorgonians that the beautiful *Cyphoma gibbosa* L. is found in profusion.

One needs a strong iron bar and diving goggles in order to dislodge and turn over the coral heads which grow close to the bottom. The larger the coral, the harder one has to work to break it loose, but once over he will find himself well repaid for the effort. There will be found *Cypraea cinerea* Gmel., *C. spurca* L., *Conus regius* Gmel., with its pretty variety *cardinalis* Hwass, and *C. citrinus* Gmel. This is the favorite hiding place for *Pecten ornatus* Lam. and *P. imbricatus* Gmel. as well as myriads of minute and dozens of large and small chitons that abound in Bahaman waters.

If one is fortunate in finding the den of an octopus, it is often possible to collect fresh dead bivalves and other shells not often collected alive. It was in one of these dens that I collected two specimens of *Casmaria vibex* L. I had often heard that this shell had been collected in the West Indies but it was not until I collected these two that I had ever seen one from there. Octopi are very plentiful among the Bahaman reefs.

In December 1943, I took a trip to Andros Island which lies about 35 miles west of Nassau across the Tongue of the Ocean. There I collected along the reef from Staniard Rock north around Morgans Bluff to the large sand flats above Lowe Sound.

The reef along the northeastern shore of Andros is considered the finest coral reef in the world. From here was removed intact a large section and restored in the American Museum of Natural History in New York.

It was on Pigeon Key that I had my best collecting. Here I turned a very large coral and found under it 10 superb specimens of *Calliostoma jujubinum rawsoni* Dall, a two inch specimen of *Pecten ornatus* Lam., and a fine *Pecten imbricatus* Gmel.

On the grassy stretches near the key, I picked up several 4 to 6 inch *Murex pomum* Gmel. feeding on *Codakia* and other bivalves. On the grass blades lived beautiful green purple and mottled chitons which I have been unable to identify.

I had only one collecting trip to Eleuthera Island. The Atlantic or eastern side of the island has but few beaches which are pink in color from the erosion of the pink coral that grows on the reef. There had been a tropical squall a few days before I got there and collecting could be done only in the well protected places. There I collected several different smaller species that are not generally found in the other islands I visited.

On the bay side at Governor's Harbour at low tide, I found *Murex rufus* Lam. plentiful, feeding upon *Mytilus citrinus* Bolten, which live in great beds in the shallow water of the bay. There to be had are *Latirus infundibulum* Gmel. and *L. cayohuesonicus* Sow., also *Marginella guttata* Dillw. and very fine and colorful specimens of *Tegula fasciata* Born and *Turbo castancus* Gmel.

Dredging in the Bahamas is very hard work and my attempts at Andros and Eleuthera were fruitless. Unless one has the equipment for deep work below the depth that coral lives, it is extremely doubtful whether any success may be realized. Since I did not have my equipment with me and war-time restrictions prevented a trial, I am not in a position to state what results may be expected from deep water dredging. However, I dredged in Nassau Harbor which has a sandy and shell bottom up to 10 fathoms with very fine success. It was in this way that I collected most of my best shells. From Nassau Harbor alone I dredged and otherwise collected eleven different species of *Mitra* which seems to be a near record for West Indian Mitra. They include one fine specimen of *M. histrio* Lam. which is exceedingly rare in the Bahamas.

Nassau is a quaint old town with quite a continental air about it, which seems strange with its proximity to the Florida coast. There are several boats that run regularly to the different out Islands which makes it ideal for the prospective collector in being able to get around to the various collecting grounds.

The Gulf Stream is the big factor in keeping many of the West Indian shells from migrating to Florida waters. Then, there seems to be a different kind of water around these islands, free

from pollution and ideal for molluscan life. The water is very clear and the most vivid blue and green I have ever seen.

I, for one, am certainly planning to revisit the Bahamas, as there is plenty of virgin territory for the shell collector there. There are hundreds of Keys and islands that make up the group.

The Nassau Conchological Society has among its members several very enthusiastic collectors, and they are to be commended upon the fine work they are doing in helping to acquaint interested malacologists and scientists with Bahaman shells.

Certainly, I consider that the West Indian shells are second to none in the world in beauty, and the Bahamas in particular are extremely rich in shell life. Those that can will surely make no mistake in choosing these Islands for a field trip.

PLEUROCERIDAE OF THE COOSA RIVER BASIN

By CALVIN GOODRICH

Hydroelectrification of the Coosa River, Alabama, has caused miles of rapids, the natural habitat of pleurocerids, to be covered with deep water. Behind the huge dams silting has gone on which probably by this time is several feet deep. Below the dams the rush of waters has varied as variation came in the production of electrical power. On top of these inimical conditions has been an increase in turbidity because of field wash. Great populations of the gastropods have been destroyed and it is very likely that entire races have been wiped out as well. It seems fitting in the case to review this molluscan fauna if only as a sort of autopsy. Besides being the richest of its kind in forms and numbers of individuals, that fauna embodied an endemic genus and, shells of tributaries included, nearly fifty endemic species.

Anculosa

In 1922, a study was made of members of the genus which occupied the Alabama River system. A re-examination in 1943 has confirmed most of the decisions of 1922, but in a few instances other opinions have been reached, due to a better understanding of the Pleuroceridae as a whole. While there has been

an interchange of species of *Goniobasis* with those of the Tennessee River, there has been no such crossing over among the Anculosae. This appears to argue a long separation of the two rivers and only rarely an instance of stream capture by one or the other. Conditions in the Coosa have led to the development of several distinct species whereas those of the Tennessee have been uniform enough to keep the number to one closely related group. Retention of the primitive plicae is marked in the shells of one river, their loss in the other. In both systems are forms in which the operculum has become ribbon-like, but only in the Coosa are species having spinose opercula. The radulae are alike in each stream in having lateral teeth with cleaver-like folds.

Anculosa picta Conrad. Sillman's Journal, 2, 1834, p. 342, pl. 1, fig. 15. An Alabama River shell which enters the Coosa only as far as gravel bars below the last series of rapids.

A. formosa Lea. Proc. Acad. Nat. Sci., 12, 1860, p. 187. Confined to the Coosa River, Etowah County, to Butting Ram Shoals, Coosa County, Alabama.

A. foremani Lea. Proc. Amer. Phil. Soc., 2, 1842, p. 243. Distribution is from Three Island Shoals, Talladega County, to Butting Ram Shoals.

A. clippeata H. H. Smith. Misc. Pub. 7 Mus. Zool., Univ. Mich., 1922, p. 191, pl. 1, figs. 8–10; pl. 3, fig. 8. Notable for a large, very loosely coiled operculum; probably primitive. This appears in the Coosa River near Riverside, St. Clair County, Alabama, and ranges to Butting Ram Shoals.

A. downiei Lea. Proc. Acad. Nat. Sci., 20, 1868, p. 153. The characteristic upstream form of the genus, and in all probability simply a phase of *A. formosa*. It is common to parts of the headwaters in Georgia and disappears in the Coosa at about St. Clair County, Alabama. In 1922, a small shell similar to *A. downiei* was described as *A. modesta* H. H. Smith. It is seen now to be a depauperate or diseased manifestation of *downiei*, with which apparently Smith found it. It was restricted to that part of the Coosa bordering Cherokee and Etowah counties, Alabama.

A. taeniata (Conrad). New F.W. Shells of U.S., 1834, p. 63. In the Coosa from St. Clair County downstream. It is also the commonest *Anculosa* of the Alabama River and penetrates the Cahaba for a short distance.

A. taeniata lucida, new subspecies. This is a shell of Coosa tributaries that in 1922 was identified as *A. ampla* Anthony. It is smaller than the riverine *taeniata,* somewhat wider in proportion to height than that species, and is wanting in plicae or revolving folds. It is to be considered a small stream mollusk, living under variable and possibly inimical conditions.

A. coosaensis Lea. Proc. Nat. Acad. Sci., 13, 1861, p. 54. Very like *A. taeniata* and quite likely identical with it, as Tryon believed. Known distribution is restricted to the Coosa at Fort William and Peckerwood shoals, Talladega County, Alabama.

A. griffithiana Lea. Proc. Amer. Phil. Soc., 2, 1841, p. 83. Especially common in the Coosa at Wetumpka, but does not range farther upstream than Butting Ram Shoals.

A. aldrichi H. H. Smith. Misc. Pub. 7 Mus. Zool., Univ. Mich., 1922, p. 31, pl. 1, figs. 1, 2; pl. 3, fig. 16. Possibly only a small localized race of *A. taeniata,* subglobose and without sculpture. Taken by T. H. Aldrich in the Coosa at the mouth of Yellowleaf Creek, Chilton County, Alabama.

A. choccoloccoensis H. H. Smith. Mis. Pub. 7 Mus. Zool., Univ. Mich., 1922, p. 34, pl. 1, fig. 7; pl. 3, fig. 14. Known only from Choccolocco Creek, Talladega County, Alabama. May be simply a small stream race of *A. taeniata.*

A. brevispira H. H. Smith. Misc. Pub. 7 Mus. Zool., Univ. Mich., 1922, p. 35, pl. 1, fig. 6; pl. 3, fig. 12. Common on Fort William Shoals, and ranging downstream to the Bar and Duncan's Riffle, Chilton County.

A. sulcata H. H. Smith. Misc. Pub. 7 Mus. Zool., Univ. Mich., 1922, p. 45, pl. 2, fig. 45; pl. 3, fig. 20. Found by Smith in great numbers on Ten Island Shoals, St. Clair County, Alabama. It ranges only to Peckerwood Shoals, Talladega County.

A. showalterii Lea. Proc. Acad. Nat. Sci., 12, 1860, p. 63. Possibly a depauperate form of *A. sulcata.* If not a good species, it should, as an earlier named form, have priority over *sulcata.* The doubtfulness of *showalterii* applies also to *A. lirata* H. H. Smith, 1922, and similar to it.

A. occultata H. H. Smith. Misc. Pub. 7 Mus. Zool., Univ. Mich., 1922, p. 48, pl. 2, figs. 31–33; pl. 3, fig. 21. Seemingly a race which has lost the primitive plicae and the secondary striae.

It is apparently confined to the shoals bordering Chilton and Coosa counties, Alabama.

A. rittata Lea. Proc. Acad. Nat. Sci., 12, 1860, p. 188. An occupant of swift water, fairly common in the Chilton and Coosa County Shoals, rare at Wetumpka.

A. ligata Anthony. Proc. Acad. Nat. Sci., 12, 1860, p. 67. Known as from the Coosa River, Weduska Shoals, Shelby County, to Wetumpka.

A. flexuosa H. H. Smith. Misc. Pub. 7 Mus. Zool., Univ. Mich., 1922, p. 33, pl. 1, fig. 17. A very puzzling form, observed only at Wetumpka. There are strong reasons for believing it not a good species, but rather a hybrid of *A. taeniata* and *griffithiana*.

Pleurocera

About thirty species have been credited to the drainage of the system of which the Coosa River is a part. On close study and comparison, they resolve themselves into four forms, and even these are not very distinctive. The specific names, in short, are to be considered conveniences in sorting rather than clean-cut differentiations.

Pleurocera vestitum (Conrad). New F.W. Shells of U.S., 1834, p. 57, pl. 8, fig. 12. Especially common in head streams and tributaries nearly to the river discharge. Absent in the river itself.

P. showalterii (Lea). Proc. Acad. Nat. Sci., 14, 1862, p. 172. A transition form, extremely variable, of the lower part of main Coosa headwaters and that part of the river which is in Georgia.

P. prasinatum (Conrad). Amer. Jour. Sci., 25 series 1, p. 342, pl. 1, fig. 14. A heavy form of the middle and lower Coosa River, occurring in numbers in quiet stretches. Specimens found in rapids are apparently wanderers.

P. foremanii (Lea). Proc. Amer. Phil. Soc., 2, 1842, p. 242. A shell bearing nodules on lower whorls, doubtless vestiges of plicae once prevailing. As occurrence of the sculpture in one locality of the Cahaba River is plainly a reversion, the same thing may be true of the shells of the Coosa. It has been found in the basin from the Etowah River of Georgia downstream, and at the mouths of a few side streams.

Goniobasis

The accumulation of synonyms in this genus has been carried further among inhabitants of this basin than any other, but the list remains formidable even after a bold reduction of synonymous forms. The species can best be dealt with here according to their general habitats. Shells purely of headwaters, creeks, brooks and springs are:

Goniobasis carinifera (Lamarck). Hist. Nat. Animaux sans Vertebres, 6, 1822, p. 167, pl. 2. Common throughout the system. The largest stream occupied is Etowah River, Floyd County, Georgia. The species has crossed into parts of the Tennessee River.

G. striatula (Lea). Proc. Amer. Phil. Soc., 2, 1841, p. 15. Shells of Coahulla Creek, Whitfield County, Georgia, correspond to forms so-named immediately to the north in the Tennessee drainage.

G. carinocostata (Lea). Proc. Amer. Phil. Soc., 4, 1845, p. 165. Fairly common in creeks from Whitfield County, Georgia, to Elmore County, Alabama.

G. bentonensis Lea. Proc. Acad. Nat. Sci., 14, 1862, p. 271. Very like *G. carinocostata,* but having a distinctive sculpture. Taken in small branches of Calhoun and Talladega counties, Alabama.

G. ornata Lea. Proc. Acad. Nat. Sci., 20, 1868, p. 152. Confined to a few miles of the Connesauga River, Georgia, and nearby tributaries. Probably a hybrid of *G. gerhardtii* Lea and *caelatura* (Conrad).

G. gerhardtii Lea. Proc. Acad. Nat. Sci., 14, 1862, p. 270. North Georgia to lower tributaries of the Coosa. It has nine known synonyms.

G. cahawbensis (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 121. Commonest in the Cahaba River, but has crossed into Waxahatchee Creek of the Coosa, Shelby and Chilton counties, Alabama.

The following mollusks either occupy both creeks and the main river or belong to groups which are alike riverine and of small streams:

G. crenatella (Lea). Proc. Acad. Nat. Sci., 12, 1860, p. 93. Known from the Coosa River, St. Clair to Chilton County, Alabama; creeks of St. Clair, Etowah and Talladega counties.

G. vanuxemiana (Lea). Proc. Amer. Phil. Soc., 2, 1842, p. 242. In the Coosa, Etowah County and downstream, and the mouths of a few tributaries of the same range.

G. caelatura (Conrad). Proc. Acad. Nat. Sci., 4, 1849, p. 154. Georgia headwaters to side streams of Talladega County, Alabama. Six forms are recognizable as subspecies on the basis of variation in sculpture.

G. bullula (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 121. Coosa River, Cherokee County, Alabama, to near the Narrows, Coosa County; in five tributaries between these points.

G. fascinans (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 119. A creek form, Calhoun to Coosa County, and found occasionally in the main stream.

G. alabamensis (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 121. Particularly common in middle sections of the Coosa, and found also in creeks of Talladega County.

G. bellula (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 122. Described as from Yellowleaf Creek, Shelby County, Alabama, but much more common in middle part of the Coosa. Taken also in Choccolocco Creek, Talladega County.

G. capillaris (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 122. Coosa River, Floyd County, Georgia, to shoals of Chilton and Coosa counties, Alabama; in Etowah River, at Rome, Georgia, and creeks to Talladega County, Alabama.

The species which follow are confined to river conditions so far as known:

G. clausa (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 120. Shoals of St. Clair County only.

G. haysiana (Lea). Proc. Amer. Phil. Soc., 2, 1842, p. 242. A lower river form, very common at Wetumpka.

G. jonesi Goodrich. Misc. Pub. 31 Mus. Zool., Univ. Mich., 1936, p. 31. A new name for *G. wheatleyi* Lea, preoccupied. Ten Island Shoals, St. Clair County, to the Bar, Chilton County.

G. lachrmya (Anthony, Reeve). Monograph Melania, 1861,

sp. 472. Gilbert's Ferry, Etowah County, to near Childersburg, Talladega County.

G. gibbera H. H. Smith. Misc. Pub. 31 Mus. Zool., Univ. Mich., 1936, p. 41, pl. 1, fig. 9. Seen only from shoals of St. Clair County.

G. laeta (Jay). Cat. Recent Shells, 3rd ed., 1839, p. 122, pl. 7, fig. 11. Cherokee County to Elmore County.

G. pilsbryi Goodrich. Nautilus, 41, 1927, p. 58. A new name for *Melania showalterii* Lea, preoccupied. Hall's Island, Talladega County, to mouth of the Yellowleaf Creek of Chilton County.

G. hartmaniana (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 117. St. Clair to Elmore County.

G. macglameriana Goodrich. Misc. Pub. 31 Mus. Zool., Univ. Mich., 1936, p. 48, pl. 1, fig. 20. Yancy's Landing, Floyd County, Georgia, to Riddle's Bend, St. Clair County, Alabama.

G. pygmaea H. H. Smith. Misc. Pub. 31 Mus. Zool., Univ. Mich., 1936, p. 49, pl. 1, fig. 17. Found so far only on Three Island Shoals, Talladega County.

G. impressa (Lea). Proc. Amer. Phil. Soc., 2, 1841, p. 83. Leoto Shoals, St. Clair County, to rapids of Coosa County.

G. fusiformis (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 54. Weduska Shoals, Shelby County, to Wetumpka, Elmore County.

G. brevis (Lea). Proc. Amer. Phil. Soc., 2, 1842, p. 242. Restricted to middle and lower reaches of the Coosa.

G. pupaeformis Lea. Proc. Acad. Nat. Sci., 16, 1864, p. 112. From the vicinity of Riverside, St. Clair County, to Wetumpka.

Gyrotoma

In a study of this genus in 1924 with the unexampled H. H. Smith collections as a basis, the shape and depth of the sutural fissure were relied upon for differentiation among the species. The writer is not so sure, after twenty years, that the thirteen species then recognized by this standard are actually good species. For one thing, the range of the whole genus is only about one hundred and twenty miles of river. The habitats are shoals and reefs over which the currents are heavy. In all the forms, the operculum is large, thick and leatherly, the spiral lines nearly

obsolete. The radulae, too, are alike. Considering how greatly a given species of *Goniobasis* may vary, and a member of *Pleurocera* more so, it is reasonable to suppose that variation in *Gyrotoma*, including its fissure, may be greater than was supposed in 1924. But in the absence of better information on the subject, the species are listed here as they were then recognized.

Gyrotoma pyramidatum Shuttleworth. Mittheilungen der Naturforschenden Gesellshaft, Bern, 1845, p. 88. The first of the genus to appear in the river, and notable for being nodulous, an aspect taken on by two other genera in those reaches, Ten Island Shoals, St. Clair County, Alabama, to the mouth of Yellowleaf Creek of Shelby County.

G. spillmanii (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 54. Possibly identical with the above. Known only from two shoals of Talladega County, Alabama.

G. pagodum (Lea). Proc. Amer. Phil. Soc., 4, 1845, p. 167. A lower river form, The Bar, Chilton County, to Wetumpka, Elmore County.

G. pumilum (Lea). Proc. Acad. Nat. Sci., 12, 1860, p. 187. Weduska Shoals, Shelby County, to Wetumpka.

G. alabamensis (Lea). Proc. Acad. Nat. Sci., 12, 1860, p. 187. Peckerwood Shoals, Talladega County, to Duncan's Riffle, Chilton County.

G. cariniferum Anthony. Proc. Acad. Nat. Sci., 12, 1860, p. 66. Smith found this confined to a reef at Fort William Shoals, Talladega County, in very swift water; a few others in a pool as if washed there.

G. lewisii (Lea). Proc. Acad. Nat. Sci., 21, 1869, p. 62. May be only a form of *Goniobasis impressa* (Lea). Confined, so far as known, to two shoals of Talladega County.

G. hendersoni H. H. Smith. Misc. Pub. 12 Mus. Zool., Univ. Mich., 1924, p. 18, pl. 2, figs. 19–21. Also under suspicion as a *Goniobasis*. Fort William Shoals only.

G. excisum (Lea). Proc. Amer. Phil. Soc., 2, 1843, p. 242. Typifies the group having very deep fissures. Three Island Shoals, Talladega County, to Wetumpka.

G. laciniatum (Lea). Proc. Amer. Phil. Soc., 4, 1845, p. 167. Possibly a small phase of *G. excisum*. Fort William Shoals to Wetumpka.

G. incisum (Lea). Proc. Amer. Phil. Soc., 2, 1843, p. 243. Typifies the group having shallow, triangular fissures. Weduska Shoals to Wetumpka.

G. walkeri H. H. Smith. Misc. Pub. 12 Mus. Zool., Univ. Mich., 1924, p. 25, pl. 2, figs. 30–32. May be a depauperate phase of *G. incisum*. Weduska Shoals to Butting Ram Shoals, Coosa County, a range of only a few miles.

G. amplum Anthony. Proc. Acad. Nat. Sci., 12, 1860, p. 66. Collected in small numbers, Talladega to Coosa County.

Lepyrium

L. showalteri (Lea). Proc. Acad. Nat. Sci., 13, 1861, p. 55, is not included with Coosa gastropods because, it is suspected, it is a species of the Cahaba River. It is not to be forgotten, however, that a parade of collectors visited the Coosa before numbers of its mollusks were revealed. It is not too certain but that *Lepyrium* has kept in hiding just as effectually. Lea described the shell as a *Neritina;* Dall considered it an offshoot of this genus. On the strength of peculiarities of operculum and radula, H. D. Russell assigned it to the Hydrobiidae.

SPHAERIIDAE OF THE COOSA RIVER BASIN

By CALVIN GOODRICH

Of the four species of these small bivalves that A. A. Hinkley collected in the drainage of the Alabama River, just half were in streams of the Coosa, none at all in the river proper. Herbert H. Smith, though his work in the basin was much more extensive, was not strikingly more successful. Judged by these findings and the fact that the Smith lots were small in comparison with what can be taken in the north, the Coosa and its tributaries in the pre-hydroelectrification days were not very favorable to the existence and multiplication of Sphaeriidae. The impression is borne out by two or three unsorted takings that R. E. Call made at Wetumpka near the discharge and where sweepings of miles of river would accumulate. Only occasional valves turned up in them. The alteration of conditions in recent years to vast

impoundings may have improved matters for the family, but in the absence of collecting nothing is known as to that. Herrington and Brooks, Nautilus, 57, 1944, pp. 93–97, have made a preliminary revision of the group. However, for the purposes of this paper, it has been thought advisable to follow the determinations by Dr. Victor Sterki, very nearly all the specimens having passed through his hands.

Sphaerium

Sphaerium striatinum (Lamarck). An. sans Vert., 1818, p. 500. The species was found in the Coosa River at Riddle's Bend, Cherokee County, Alabama, and nowhere else in the main stream, H. H. Smith, collector. He brought it to light in creeks of Floyd County, Georgia, besides a tributary in Elmore County, Alabama.

S. stamineum (Conrad). Amer. Jour. Sci., 25, 1834, p. 342, pl. 1, fig. 5. Shells from Armuchee Creek, Floyd County, Georgia, and Little Will's Creek, Etowah County, Alabama, have been identified as this form.

S. fabale (Prime). Proc. Boston Soc. Nat. Hist., 4, 1851, p. 159. Unknown from the Coosa itself, but scattered among creeks from Georgian headwaters to Shelby and Talladega counties, Alabama.

S. solidulum (Prime). Proc. Boston Soc. Nat. Hist., 4, 1851, p. 158. This is another small stream form, having about the same distribution in the basin as *S. fabale*.

S. occidentale Prime. Proc. Acad. Nat. Sci., 12, p. 295. Taken by Smith in a creek near Ten Island Shoals, St. Clair County, Alabama, and "two miles south of Wetumpka," the locality not otherwise identified.

Musculium

Musculium contractum (Prime). Monograph of Amer. Corbiculidae, Smithson. Misc. Coll., No. 145, 1865, p. 48. One of the two type localities given by Prime is Prairie Creek, Marengo County, Alabama, draining into the Black Warrior River. Dr. E. R. Schowalter was the collector. Smith found the species in

the Coosa River, Chilton County, and in a branch of Corn Creek, near Wetumpka, Elmore County, both in Alabama.

M. transversum (Say). New Harmony Disseminator of Useful Knowledge, 2, 1829, p. 356. Known from the Coosa in Talladega, Shelby and Coosa counties, Alabama; pools at Wetumpka, and small streams from Rome, Georgia to Shelby County, Alabama. As the species flourishes in muddy and stagnant waters and can multiply in spots in which free oxygen is almost entirely absent, it may be expected to appear in numbers throughout the transformed sections of the Coosa.

M. elevatum (Haldeman). Proc. Acad. Nat. Sci., 1, 1841, p. 53. Prime spoke of the shell as rare, and it was not observed by Hinkley. Smith, however, collected it in the Coosa at Center Landing, Cherokee County, Alabama; the lower part of the Chattooga River, the same county, and Armuchee Creek, Floyd County, Georgia.

Eupera

Eupera cubensis (Prime). Monograph of Amer. Corbiculidae, Smithson. Misc. Coll., No. 145, 1865, p. 58. Specimens so named in the Walker Collection are assigned to the Coosa River, Weduska Shoals, Shelby County, Alabama. Inasmuch as the species was originally of West Indian origin, it seems likely that the Alabama shells belong rather to the following:

E. singleyi (Pilsbry). Proc. Acad. Nat. Sci. for 1889, p. 88, pl. 3, figs. 14, 15. Taken in Yellowleaf Creek, Shelby County, which enters the Coosa River near Fort William shoals, Alabama. Smith found it also in a creek near Wetumpka, Elmore County. It is known to be in the Black Warrior and the Talapoosa rivers, belonging to the Alabama drainage as well as does the Coosa.

Pisidium

If that is possible, the nomenclature of this genus is in worse state than any other of the Sphaeriidae. It is made up of minute shells of very indefinite characters and to small variations in shape, texture, color and prominence of beaks have been given names. How much these may be due to food conditions, tem-

perature, the chemistry of water and current and wave action is known not in the least, and in fact the assumption has been that they have no influence on either the hard or soft parts of the bivalves. Distributional data may be of small value since means of dispersal over very wide areas seem quite easy. So what is here set down might be greatly added to as collecting goes on, just as the the number of species is apt to be reduced when a yardstick is shaped for passing on their characteristics.

Pisidium abditum Haldeman. Proc. Acad. Nat. Sci., 1, 1843, p. 53. The shell has been collected in the headwaters of Etowah River, Floyd County, Georgia, and in the Coosa from a little below Rome, Georgia, to parts of the river bordering Coosa and Chilton counties, Alabama.

P. atlanticum Sterki. Nautilus, 18, 1905, p. 128. Found in the Coosa from Cherokee County to pools at Wetumpka, Elmore County, Alabama, and in creeks of Talladega and Shelby counties, the same state.

P. compressum Prime. Proc. Boston Soc. Nat. Hist., 4, 1851, p. 161. The typical form as recognized by Sterki occurs in the Coosa River from Cherokee County, Alabama, to Wetumpka; in creeks of Floyd County, Georgia; Cherokee, Etowah, St. Clair, Shelby and Talladega counties, Alabama. Records for the subspecies *coosaense* Sterki are Etowah River, near Kingston, Bartow County, Georgia, and the Coosa River, at three localities of Talladega County, Alabama; for the subspecies *contrarium* Sterki, Coosa River, above Coosa Valley, Talladega County.

P. limatulum Sterki. Nautilus, 18, 1905, p. 108. Reported from Valley Head, Dekalb County, and a small tributary of the Coosa at Fort William Shoals, Talladega County, both in Alabama.

P. noveboracense Prime. Ann. N. Y. Lyc., 6, 1853, p. 66, pl. 1, fig. 3. Shells pronounced typical by Sterki were taken by Smith in the Coosa at Peckerwood Shoals, Talladega County, and Weduska Shoals, Shelby County, Alabama. The subspecies *alabamense* Sterki is credited to the Coosa at Riverside, St. Clair County, and Fort William Shoals, Talladega County, Alabama; creeks of Floyd County, Georgia; Dekalb, Calhoun, Etowah, St. Clair and Shelby counties, Alabama.

P. singleyi Sterki. Nautilus, 11, 1898, p. 112. Apparently one of the rarities, for it was found by Smith only in Ohatchee Creek, Calhoun County, and Talladega Creek, Talladega County, Alabama.

P. dubium (Say) (=*virginicum* of authors, not Gmelin). Nicholson's Amer. Encycl. 1816. Collected by Smith in the Coosa River from its source at Rome, Floyd County, Georgia, to Talladega County, Alabama; in the large headwaters tributaries, Oostanaula and Etowah rivers, and creeks near Rome, and downstream in creeks of Etowah, St. Clair, Shelby and Talladega counties, Alabama.

A NEW PECTINID SHELL FROM THE PACIFIC OCEAN, WITH A NOTE ON THE GENUS PALLIUM SCHROETER*

By HARALD A. REHDER

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Mr. V. D. P. Spicer forwarded to the U. S. National Museum an interesting lot of marine shells which he collected on Christmas Island, one of the Line Islands, south of the Hawaiian Group. Among them was a member of the Pectinidae which appears to be undescribed, and which I take pleasure in dedicating to the discoverer.

Comptopallium spiceri, new species. Plate 2, figures 1, 2.

Shell of medium size, subequivalve, the left valve somewhat flatter than the right; valves equilateral, except that the anterior auricles are larger than the posterior ones. The sculpture consists of broad, rounded, rather distantly separated ribs (8 in left valve, 9 in right), and very fine axial riblets, which are strongest on the ribs, where one or more at the summit are elongately knobbed; the smaller marginal ribs may bear small scaly spines. Very fine growth lines are visible especially between the ribs. Auricles subequal, the right posterior one finely and closely radiately ribbed, the others more irregularly and distantly ribbed.

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External hinge margin of right valve with several erect squamiform nodules. The byssal notch in the right valve has a short ctenolium with six teeth. Color white, irregularly concentrically streaked with reddish-orange and yellowish-orange (near the ventral margin). Internally the auricles have several short elongated nodules near the lateral margins, and the left valve has two narrow dorsal ridges running from the resilifer parallel to and as long as the hinge margin. These fit between similar ridges in the right valve, the upper ones equally long, the lower ones less than one-third as long; the area of these ridges has minute, axial vermiculate sculpture. There are numerous short white radial ridges along the margin of the shell. The interior shows the external reddish-orange color shining through and the margin is, moreover, tinted with orange.

The type, figure 1, U.S.N.M. No. 518010, is a right valve, and measures: Height, 39.8 mm.; breadth, 37.9 mm.

A paratype, figure 2, U.S.N.M. No. 518011, is a left valve, and it measures: Height, 35.2 mm.; breadth, 32.2 mm.

Both valves were collected on Christmas Island (157° 20′ W. Long., 1° 55′ N. Lat.), Line Islands, Central Pacific, by Mr. V. D. P. Spicer.

This species differs from the genotype, *C. pauciplicatum* Iredale, from Queensland, and *C. radula* Linné from the East Indies, in being smaller, broader, with fewer, broader, and more rounded ribs and with much finer concentric sculpture. The coloring is also brighter.

The name *radula* has been dismissed from the Pectinidae by Iredale [1] because the figures cited by Linnaeus were those of a *Lima*. The brief diagnosis, however, is obviously that of a pectinid and applicable to the group in question; it is in total disagreement with the figures, as was often the case in the Systema Naturae. That Linnaeus realized these references were faulty is shown by the fact that eight years later, in the Museum Ludovicae Ulricae, he transfers the original Rumphius reference, of which the Kleinian figure is merely a copy, to *Ostrea lima*, and uses instead the citation Rumph. Mus. t. 44, fig. AA, which correctly represents the shell usually known as *radula* Linné. For these reasons I see no valid reason for not using *radula* as a valid name in the genus *Comptopallium*.

[1] British Museum. Great Barrier Reef Exped., 1928–29, Sci. Reports, vol. 5, No. 6, Mollusca, pt. 1, 1939, p. 360.

This species has usually been placed in *Pallium* Schumacher 1817, but as Cox [2] has pointed out, that name is preoccupied by *Pallium* Schröter 1802.[3] However, neither Cox, nor any author who has followed him, as Iredale (l.c.) and Hertlein,[4] has fixed Schröter's name.

As the work in which Schröter's article appears may not be readily available to most workers, I am giving a translation of the remarks on this name:

XIV. PALLIUM

I hope I may be permitted the introduction of this new name that I give the scallops, which, as is known, Linné placed under *Ostrea,* and which have in common with this Linnean genus only the hinge pits; moreover, they form a nucleus and really very handsome family, which deserves a general Latin name of their own, which the German, who calls them "Mäntel" has for a long time given them. Of course the Latin name *Pectines* has long been known and accepted, a name the Frenchman also uses (Peignes); however, since there are smooth and finely striate scallops, which can in no way be compared to the teeth of a comb, and since furthermore the name *Pectinitae* is given in paleontology to those strongly arcuate shells, which find their parallel not among the scallops but under the heart shells, therefore I hope the name *Pallium* will offend no one.

From this we see that to all intents and purposes *Pallium* is a substitute name for *Pecten* and thus becomes an exact synonym of *Pecten* Müller 1776, with the same genotype, *Pecten maximus* (Linné).

The discussion of the name is followed by a description of eight new species, none of which are figured, and of which only a few have any locality given. It may be noted that the first species, *Ostrea albicans,* is the shell commonly known as *Pecten laqueatus* Sowerby [5] from Japan, which will therefore take the name *Pecten albicans* (Schröter), with Sowerby's name as a synonym.

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[2] Proc. Malac. Soc. London, v. 18, 1929, p. 201.

[3] Archiv für Zoologie u. Zootomie, v. 3, 1802, pp. 135–136.

[4] Nautilus, v. 50, 1936, pp. 25–26.

[5] Thesaurus Conchyliorum, vol. 1, p. 46, pl. 15, fig. 101, 1842.

VERTICAL DISTRIBUTION OF SHIPWORMS IN HAWAIIAN WATERS

By C. H. EDMONDSON

Bernice P. Bishop Museum, Honolulu

Few controlled experiments have been made in Hawaii to determine the vertical distribution of shipworms which prevail in near shore areas or to learn how far off shore their larvae may range. Dall, Bartsch and Rehder [1] described a species, *Teredo (Teredops) hawaiensis,* from material recovered from a piece of palm wood dredged by the *Albatross* off the south coast of Oahu in 211–53 fathoms. The position of the wood when first attacked by the marine borer is, of course, unknown.

By use of test blocks Edmondson [2] found the destruction of Douglas fir wood, during a period of 47 days, was 20 times greater at the bottom of Honolulu Harbor (depth 30 feet) than at the surface, with several species of shipworms involved. Some species were about evenly dispersed from surface to bottom, others were concentrated at one level or another.

Data on the range of certain shipworms in somewhat deeper water and at greater distance from shore are now available, Douglas fir test blocks were suspended in a vertical position at depths of 25, 50 and 75 feet off the southwest coast of Oahu about 1 mile from shore. They were examined after an interval of 95 days.

The blocks at depths of 50 and 75 feet were riddled by shipworms, the destruction of the one at the lower level, however, being slightly greater. The destruction of the block 25 feet below the surface was about one-fourth that of the one at 50 feet.

In all blocks the prevailing shipworm was *Teredo milleri* Dall, Bartsch and Rehder,[1] a common species throughout Hawaiian near shore waters. A few specimens of *Bankia hawaiiensis* Edmondson [2] were recovered from each test block, and one specimen of *Teredo trulliformis* Miller [3] was taken at a depth of 75 feet. Because of the increasing crowded condition of the infest-

[1] Bernice P. Bishop Museum, Bull. 153, 1938.

[2] Bernice P. Bishop Museum, Occ. Papers 28 (10), 1942.

[3] Univ. Calif. Pub., Zool. 26, 1924.

ing shipworms from the upper to lower levels, the maximum development (length) of *T. milleri* at 25, 50 and 75 feet was 125, 80 and 70 mm., respectively. All of the shipworms attacking the blocks are abundant in Honolulu Harbor and occur elsewhere about the islands in very shoal water. There were no attacks on the off shore test blocks by *Martesia* or any crustacean marine borer.

LIST OF MOLLUSCA FROM AROUND BEAUFORT, N. CAROLINA, WITH NOTES ON TETHYS

By ANNE GRAY HACKNEY

The following list is the result of four summers' collecting in the vicinity of Beaufort, N. Carolina. This has long been a famous collecting ground, as the U. S. Bureau of Fisheries and the Marine Laboratory of Duke University are situated here, on Pivers Island. The location is an interesting one, and worthy of its fame, for it is far enough south for many of the Florida species and far enough north for those of the Virginian Province to live.

Chaetopleura apiculata Say. On rocks of the breakwater at Pivers Island.

Solemya velum Say. Living, buried in mud between tides, in Bogue Sound.

Nucula proxima Say. *Nuculana acuta,* Con. Single valves, on beach.

Yoldia limatula Say. One single valve, a juvenile specimen, attached to worm tube.

Arca campechiensis Gmel. Living, in mud at low tide.

Arca campechiensis americana Wood, *A. incongrua* Say, *A. transversa* Say.

A. secticostata Rve., *A. occidentalis* Phil., *A. umbonata* Lam. Single valves common on the beach. Very young *A. transversa* and *A. c. americana* are often found attached to seaweed or sponge.

Arca reticulata Gmel. One single worn valve.

Noetia ponderosa Say. Living, buried in mud at low tide, in the Sound. Single valves are common on the beach.

Glycymerus americana Defrance. Several worn valves, on beach.

Glycymerus pectinata Gmel. Single valves fairly common on the beach.

Atrina rigida Dill. Fresh, double valves fairly common in the Sound. They can be found living on Bird Shoal, near Pivers Island, buried at low tide.

Atrina serrata Sby. This species seems to be rather less common than *A. rigida.*

Pteria colymbus Roed. Found living on *Gorgonia,* in Bogue Sound.

Ostrea virginica Gmel. Extremely common.

Ostrea spreta Orb. Single valves, on beach.

Plicatula gibbosa Lam. Living specimens are found attached to old shells.

Pecten raveneli Dall. Single valves found occasionally on the beach.

Pecten exasperatus Sby. Two single valves picked up on beach.

Pecten irradians Lam. Living, usually in depressions just below low tide mark, in the Sound. Beach shells are common.

Pecten gibbus L. Single valves common on beach.

Pecten nodosus L. Two single valves.

Anomia simplex Orb. Found living, attached to other objects.

Mytilus recurvus Raf. Fairly common, but I have never found any living.

Mytilus exustus L. A few single valves.

Modiolus tulipus Lam. Found living, attached to old, matted *Gorgonia.*

Modiolus demissus plicatulus Lam. Extremely common in the mud flats.

Lithophaga bisulcata Orb. Found living, boring in old coral.

Modiolaria lateralis Say. Found among tangled sea wreck. Fairly common.

Pandora trilineata Say. Single valves, in shell piles on beach.

Lyonsia hyalina Con. One single valve.

Venericardia tridentata Say. Single valves quite common.

Venericardia perplana Con. Two single valves among small shells.

Chama congregata Con., *Echinochama arcinella* L. These two species are common, but I have never found them living.

Lucina radians Con. Found in stomachs of fish from Bogue Sound.

Lucina crenella Dall, *Divaricella quadrisulcata,* Orb. Single valves are very common.

Codakia orbiculata Montagu. One double shell picked up after storm. Dead.

Loripinus schrammi Crosse. Single valves common.

Trachycardium egmontianum Shutt., *T. muricatum* L. Single valves only.

Dinocardium robustum Sol. Beach specimens are very common.

Laevicardium laevigatum L., *L. mortoni* Con. Single valves only.

Dosinia discus Rve. Double shells are very common.

Dosinia elegans Con. One single, broken valve, on beach.

Macrocallista nimbosa Sol. Fresh shells are fairly common.

Pitar morrhuana Gld. Very common. Single valves.

Cyclinella tenuis Recluz. Three single valves picked up in the summer of 1943.

Chione cancellata L. This species grows large here. Common.

Chione intapurpurea Con. Rather scarce. One living specimen was found after a storm.

Chione latilirata Con. One worn valve near Ft. Macon in 1941.

Venus mercenaria L. Very common.

Venus mercenaria notata Say. Not common, but living specimens are sometimes found.

Venus campechiensis Gmel. Much less common than *V. mercenaria.*

Gemma purpurea H. C. Lea. Found among small shells on beach.

Petricola pholadiformis Lam. Living in clay in the inlet near Ft. Macon.

Petricola pholadiformis lata Dall. Single valves. Rather scarce.

Rupellaria typicum Jonas. One fresh, double shell found in sea wrack.

Tellina aequistriata Say. Single valves, on beach.

Tellina alternata Say. Fresh, double shells are sometimes found.

Tellina tenera Say. Fairly common. I have found this in fish stomachs.

Macoma constricta Brug. One worn valve.

Macoma tenta Say. Buried in mud in the Sound.

Tellidora cristata Recluz. Six single valves collected. This seems to be a new locality for this shell. C. W. Johnson lists it from Ft. Worth, Florida to Trinidad.

Semele bellastriata Con. Occasional single valves.

Semele proficua Pult. Fairly common in the Sound.

Abra aequalis Say. Common in shell piles on the beach.

Cumingia tellinoides Con. Seems to be rather scarce. Two double shells collected.

Donax variabilis Say. Extremely common at times, in colonies at low tide, on the beach.

Tagelus gibbus Speng. The shells are common, but living specimens scarce.

Tagelus divisus Speng. Rather scarce.

Solen viridis Say. Only occasional shells are found.

Ensis directus Con. Beach specimens fairly common.

Ensis minor Dall. Much more common than *E. directus*.

Mactra fragilis Gmel. Scarce.

Spisula solidissima Dillw. One large valve, on Shackleford Banks.

Spisula solidissima similis Say. Fairly common, but much less so than it is farther north.

Mulinia lateralis Say, *M. lateralis corbuloides* Desh. Both of these species are common.

Anatina lineata Say. Only single valves found.

Anatina canaliculata Say. Much more common than *A. lineata*. Double shells are sometimes found.

Mya arenaria L. These shells are common on Pivers Island.

Corbula contracta Say. In shell piles on the beach.

Saxicava arctica L. One double shell found in sea wreck.

Panope bitruncata Con. One dead, but whole specimen found buried in mud.

Gastrochaena cuneiformis Speng. Boring in coral and dead shells.

Pholas campechiensis Gmel. Two single valves, on beach.

Barnea truncata Say, *B. costata* L. Single valves.

Zirfaea crispata L. Three juvenile specimens, boring in wood.

Martesia cuneiformis Say. Common, boring in driftwood.

Teredo navalis L. This, and probably other species, boring in wood.

Dentalium texasianum Phil. Rather scarce.

Dentalium eboreum Con. Beach shells very common.

Cadulus sp. Three specimens among small shells.

Diodora cayenensis Lam. Found living, attached to piling in Bogue Sound. Dead shells are common.

Calliostoma jujubinum Gmel. One worn shell.

Turbo castaneus Gmel. Two empty shells collected.

Epitonium angulatum Say. Often found living, washed up on beach.

Epitonium humphreysii Kien. Scarce.

Epitonium lineatum Say, *E. multistriatum* Say. Occasional empty shells.

Janthina janthina L. One shell, found in 1943.

Melanella conoidea Kurtz and Stimp. In sea wrack, inhabited by hermit crabs.

Pyramidella crenulata Holmes. A few beach specimens.

Turbonilla sp. Probably more than one species collected, but I am unable to identify them positively.

Odostomia impressa Say. Living colony found under brick in Sound.

Odostomia seminuda C. B. Adams. Very common on the upper valves of *Pecten irradians;* sometimes found on seaweed.

Natica pusilla Say. In sea wreck, inhabited by small hermit crabs.

Polinices duplicata Say. Buried in sand or mud at low tide.

Sinum perspectivum Say. Empty shells are common.

Sinum maculatum Say. Two empty shells, on the beach.

Calyptraca centralis Con. One empty shell.

Crucibulum striatum Say. Worn shells are fairly numerous.

Crepidula fornicata L., *C. plana* Say. Extremely common.

Crepidula glauca Say., *C. glauca convexa* Say., *C. aculeata* Gmel. Common among dead shells.

Skenea planorbis Fab. Two shells, by sorting through coarse sand.

Adeorbis supranitidus Wood. One specimen, in coarse sand.

Littorina irrorata Say. Common on marsh grass in the mud flats.

Vermicularia spirata Phil. Dead shells.

Caecum pulchellum Stimp. Quite common among very small shells.

Caecum cooperi S. Smith. Two specimens found.

Cerithiopsis subulata Montagu. On seaweed, inhabited by hermit crabs.

Seila adamsi H. C. Lea. Among small, dead shells.

Cerithium floridanum Morch. Rather scarce. Several living specimens on Pivers Island.

Bittium varium Pfr. Common on seaweed.

Strombus pugilis alatus Gmel. Fresh beach shells are scarce.

Cyphoma gibbosa L. One badly broken shell.

Simnia uniplicata Sby. Living on *Gorgonia*, in Bogue Sound.

Cassis madagascarensis Lam. A few worn shells.

Cassis tuberosa L. One worn shell on dredged land.

Semicassis gibba Gmel. Whole, but not very fresh, shells on the beach.

Tonna galea L. One whole shell, on Shackleford Banks in 1941.

Murex fulvescens Sby. One very worn, dead shell.

Murex pomum Gmel. Scarce.

Eupleura caudata Say. Living, in the Sound.

Urosalpinx cinereus Say. Extremely common around *Ostrea*.

Thais floridana Con. One very large living specimen in the Sound. Several empty shells. Not very common.

Columbella mercatoria L. In shell piles on the beach.

Anachis avara Say, *A. avara translirata* Rav. Living on seaweed.

Anachis obesa C. B. Adams. In sea wreck, inhabited by hermit crabs.

Mitrella lunata Say. Living on seaweed.

Nassarius vibex Say, *N. obsoleta* Say. Very common in mud at low tide.

Nassarius ambigua Mont. In sea wreck.

Nassarius trivittata Say. Rather scarce. Only empty shells found.

Cantharus cancellaria Con. One empty shell.

Busycon carica Gmel., *B. contrarium* Con. Common, living, in the Sound.

Busycon canaliculatum L. Living specimens rather scarce.

Busycon pyrum Dill. Several dead shells.

Fasciolaria gigantea Kien. Old, worn shells, on dredged land.

Fasciolaria distans Lam. Common at low tide in the Sound.

Marginella apicina Menke. In shell piles on beach.

Oliva sayana Rav. Living in colonies at low tide on the beach.

Olivella mutica Say. Living, just under the sand.

Terebra dislocata Say. Common, in sand or mud, at low tide.

Terebra concava Say. Dead shells.

Conus floridanus Gabb. One worn, bleached shell.

Mangelia cerina Kurtz and Stimp. In sea wrack, inhabited by hermit crabs.

Cancellaria reticulata L. One worn shell on the beach.

Acteocina canaliculata Say. Found living on seaweed at Pivers Island.

Cylichnella bidentata Orb. One specimen, among small broken shells.

Tethys willcoxi Heilpr. One living specimen collected after storm, July 1944. This seems to be a new locality for this species.

Tethys willcoxi perviridis Pils. Five living specimens. This species is not uncommon here, but seems not to have been reported before.

Cavolina longirostris Lesueur. Dead shells among sea wreck.

Melampus bidentatus Say. Common in the mud flats.

Spirula spirula L. Beach specimens are fairly common.

Loligo pealii Lesueur. From off shore, in fishing nets.

Glottidea audebarti Brod. A brachiopod, but included as a matter of interest.

Pupoides marginatus Say. Under bricks, on Pivers Island.

Gastrocopta sp. One dead shell, in dunes at Atlantic Beach.

Succinea sp. Extremely common. This species lives even on the dry grass in the dunes.

Ventridens ligerus Say. One living specimen, under leaves and grass, at Morehead City.

Hawaiia minuscula Binn. Under rocks, at Pivers Island.

Polygyra postelliana Bland. Found living under leaves and wood, almost everywhere in the vicinity of Beaufort.

Mesodon thyroidus Say. This species seems to be rather scarce.

Triodopsis tridentata juxtidens Pils. One solitary specimen, at Morehead City, under old wood.

Triodopsis hopetonensis Shutt. Common, under leaves and wood.

Triodopsis hopetonensis obsoleta Pils. One colony found, under dead leaves, at Morehead City.

Triodopsis albolabris traversensis Walker. The commonest species here. Can be found almost everywhere. I suspect that this is Dr. Coues' "*Helix multilineata* Say," which he reported in 1871 from Ft. Macon, near Beaufort (cf. Land Mollusca of North America by H. A. Pilsbry, Vol. 1, Part 2, p. 848).

A New Locality for Tethys willcoxi and var. perviridis

Early in July 1944, a single living specimen of *Tethys willcoxi* (Heilprin) was found in a shallow depression in the sand at low tide, on the south end of Pivers Island, Beaufort, N. Carolina. As this species has not before been reported north of Florida, it seems fitting to make note of it here.

The small amount of water in which the animal was lying when picked up was stained with purple, but afterwards, in an aquarium of sea water, although it was purposely disturbed, it gave off no more of the fluid. The alcohol in which it was placed after death, was stained dark brown. It swam actively, using its swimming lobes for this purpose and its foot to crawl on the sides of the glass, as the slugs and shelled mollusks do.

In color, the sole and sides of the body were closest to pale lemon yellow, and the swimming lobes and head, taupe brown (Ridgway, Color Standards and Nomenclature). The radula

was very like that of the terrestrial mollusks, being folded in much the same manner, and with the teeth reflected. The horny jaws and fleshy lips, instead of being divided into upper and lower parts, are right and left. The contents of the stomach were noted, and it was crammed with large pieces of the red gelatinous seaweed which is so common here. The shell was fragile, with a thin, brittle coating inside, except around the edge, which was diaphanous.

Tethis willcoxi perviridis Pilsbry. is evidently a much more common species here, although it seems not to have been reported. I have collected five living specimens and have seen several others. It may be of interest to note that I have never seen any except in early July, although there are "blows" at other times that are hard enough to leave them stranded, as I have always found them.

This species, when put into an aquarium, gave off an intense purple fluid if disturbed. Later, it stained alcohol the same color, but it is possible that the animal was not entirely dead at this time. The general appearance, except for color, which is greenish, with black veins merging into darker areas, is much the same as *willcoxi*. However, the swimming lobes of *perviridis* are much less thick than are those of *willcoxi*.

Three specimens were picked up on the ocean beach at Atlantic Beach, near Beaufort, in 1943, and two on Pivers Island, along with *T. willcoxi*, in July 1944.

HAWAIIAN SPECIES OF ODOSTOMIA

By HENRY A. PILSBRY

Many years ago I was describing shells collected in Hawaii by my friends and myself in a series of papers published by the ANSP. MS. descriptions and figures prepared for another number of that series have been lying dormant in my desk drawer about 25 years. Some of them serve now to stop a gap in Plate 2.

Odostomia quinta new species. Plate 2, fig. 3.

The shell is white with a very broad tawny band occupying the median portion of the last whorl and the lower half of the

preceding whorls. Form and surface as in *O. prima* except that the shape is very much broader.

Length 7.8, diam. 2.5, length of aperture 3.5 mm.; 7 whorls.
Moomomi, Molokai. Type 47195 ANSP.

Odostomia margarita new species. Plate 2, fig. 4.

The shell is ovate-conic, bluish-white, thin but rather strong; smoothish, but under the microscope very close, fine, shallow spiral striae may be traced in some places. Whorls weakly convex, the first somewhat prominent but nearly regular. Last whorl is inflated. Aperture large, acuminate-ovate; columellar margin concave, slightly reflected and thickened. A rather strong fold above.

Length 3.6, diam. 2, length of aperture 1.9 mm.; 5 whorls.
Eastern Loch of Pearl Harbor, Type no. 116501, coll. by Pilsbry, 1913.

Odostomia monaulax new species. Plate 2, fig. 3.

The shell is oblong-conic, white, rather strong, smooth except for a spiral groove paralleling the suture below, and some irregular, impressed growth lines. The whorls are rather weakly convex, the first slightly prominent with inturned tip. Aperture ovate, the columellar fold rather sharp, median.

Length 2.45, diam. 1.1, length of aperture 1 mm.
Eastern Loch of Pearl Harbor. Type 116504 ANSP, coll. by Pilsbry, 1913.

Odostomia hiloensis new species.

The shell is oblong-conic, white, rather strong, the second and third whorls having a series of regular folds below the suture, extending over a third to a half of the whorl; last and penult whorls have a few very low spiral ridges. First whorl prominent with the tip inturned. Columellar fold rather prominent, median.

Length 2.25, diam. 1.2, length of aperture 1.0 mm.; 5½ whorls.
Hilo, Hawaii. Type 47194 ANSP, coll. by D. Thaanum.
This species will be illustrated in our next number.

LYMNAEA CONTRACTA CURRIER TAKEN ALIVE

By JAMES MATTHEW ROSS

In a recent article in this journal (Nautilus, 54: 121–22), Mr. Calvin Goodrich cited Barney Lake on Beaver Island in Lake Michigan as another locality for the hitherto rare *Lymnaea contracta.* Careful search at Barney Lake yielded only dead specimens, a condition which led Mr. Goodrich to agree with Bryant Walker's statement (Nautilus, 6: 33) that this species was probably an inhabitant of deep water .

In August of this year (1944) my father and I, working from a boat with an improvised dredge, managed to collect live specimens of this rare mollusk at what might be considered the type locality,—Roscommon County, Michigan, in Higgins Lake. We tried several places on the east side of the north bay of the lake but succeeded in finding these animals only along the east side of Flynn's Island. Because of the difficulty of working at great depths with the equipment available we can only state that the depth at which *L. contracta* lives ranges somewhere between fifteen and forty-five feet. Information generously submitted by the Institute for Fisheries Research of the Michigan Department of Conservation reveals that Seechi Disc readings taken between August 7 and 25, 1939, in Higgins Lake gave a light penetration range of twenty-two to twenty-seven feet. This transparency is about double that found in most Michigan lakes and may partially explain the ability of this animal to live at such unusual depths. The deep penetration of the light also accounts for the aquatic vegetation which was found growing at considerable depths; a circumstance which made dredging an arduous task and also impeded our efforts to determine the exact depth at which these snails live. As might be expected in an organism living in a profundal region, the animal's body contains very little pigmentation giving both the shell and the skin a strikingly pallid appearance.

NOTES AND NEWS

IMACLAVA, A CORRECTION.—When I published my little paper, "Some Notes upon West American Turrid Mollusks" (Proc. Biol. Soc. Washington, vol. 57, June 28, 1944, pp. 25–29), I named the genus *Imaclava*, citing *Imaclava ima*, a new species, as the type. Unfortunately, I had overlooked Lowe's *Clavus pembertoni* (Trans. San Diego Soc. Nat. Hist., 1935, p. 22, pl. 3, fig. 6). The type of *Imaclava* therefore will have to be *Imaclava pembertoni* (Lowe).—PAUL BARTSCH.

OTALA LACTEA (MÜLLER) IN TEXAS.—A rather vigorous colony of this species occurs at Port Arthur, Texas. Captain E. D. Parmer, returning here to Cambridge from a furlough, brought with him some 60 examples of this species which he had picked up in the garden of his mother's home. The date of importation of this common old world species is unknown. They are rather light in color, the spiral bands being very faint in most specimens. The coloration alone suggests that the original specimens may have come from Spain rather than from a locality in north Africa.—W. J. CLENCH.

NOTE ON A PACIFIC CETOCONCHA.—In using Dr. Fred Baker's card catalog of Pacific coast Mollusca, I find the name *Cetoconcha malespinae* Dall 1916. In Dall's original description, published in Proc. U.S.N.M., 52: 407, and again in Bulletin 112, page 28, the same spelling is used. Also, Mrs. Oldroyd uses it in The Marine Shells of the West Coast of North America, 1: 96. Notwithstanding the agreement of these three authorities, I believe that this is an obvious typographical error for *C. malaspinae*. The shell must have been named in honor of Alejandro Malaspina, the Italian navigator employed by Carlos III to seek the northwest passage. Although Malaspina did not leave Spain until after the death of Carlos III, he explored the coast of Alaska, and in 1791 discovered the Columbia River. The Malaspina glacier bears his name. An account of his voyage by Edith C. Galbraith appeared in the California Historical Society Review, vol. 3, no. 3, October, 1924.—JOSHUA L. BAILY, JR.

PROTEROGYNY IN DEROCERAS PANORMITANUM.—I note that in July NAUTILUS you state you have only observed the female

stage in *D. gracile* and *monentolophus*. Apparently Allyn Smith has sent you only fully grown specimens of *panormitanum*. The young, small specimens, including those in the female stage, have been confused with *D. gracile*. Over two years ago he sent me both sizes. I settled the question, as far as I was concerned, by dissecting some of the small ones, then rearing the other small ones which grew into typical "adult" *panormitanum* with fully developed genitalia, both male and female. At that time I reared four generations of *panormitanum*. Many were dissected. The life cycle was very interesting. They were fed principally vegetable matter, mostly lettuce. As early as in 33 days fully developed female genitalia were present as evidenced by active egg production. The minimum size of an egg-laying individual was 16 mm. long when fully extended. Dissection showed these individuals to be in a purely female phase. The eggs of these small female specimens were fertile, even though the slug had been isolated since hatching. That leads me to suspect that development by parthenogenesis occurs. It does not seem probably that the male elements of the ovotestis would be developed and active in specimens in which the principal male organs were undeveloped, although it is possible, and if the latter were the case then it would be simply a case of self-fertilization. Histological examination of the ovotestis at this stage would settle the problem, but I have had neither time nor opportunity to do this. There is a slower growth noted during this first active egg-laying period, and many of the slugs die after a period of reproductive activity. A small percentage of individuals, particularly specimens which have been less active egg-layers, became cannibalistic, preying on the weak and dying individuals and even eating those which were already dead. There is a sudden increase in the rate of growth at this time. Whether this suddenly increased growth creates a nutritional demand which results in cannabalism, or whether the meat diet thus obtained stimulates the increased rate of growth, is problematic. In about 90 days they reached maximum size and contain fully developed male and female organs. I hope later to review the life history studies on this species.—Wendell O. Gregg, M.D., letter to Ed.

Snails from Taylor County, Texas.—Pvt. Gordon K. MacMillan, Camp Barkeley, Texas, in the course of a fifteen day bivouac in Elm Creek Valley, 8 miles southwest by south of Buffalo Gap, Taylor Co., collected a small quantity of fine drift debris from the creek banks after a heavy rain. The following species were found:

Helicodiscus nummus Van.
Glyphyalina indentata Say.
Hawaiia minuscula Binn.
Euconulus c. trochulus Reinh.
Zonitoides arboreus Say.
Vallonia perspectiva Sterki.
Vallonia not det.
Gastrocopta cristata P. & V.
Gastrocopta procera sterkiana Pils.
Gastrocopta procera mcclungi H. & J.
Gastrocopta holzingeri Sterki. var.
Gastrocopta pentodon Say.
Gastrocopta pellucida hordeacella Pils.
Pupoides marginatus Say.
Vertigo ovata Say.
Helisoma anceps Mke.
Gyraulus parvus Say.
Lymnaea not det.
Physa, young only.
(*Cypris,* several species.)

It will be seen that most are species widely spread in Texas, but as no mollusks have been recorded from Taylor or any neighboring county, the list helps to fill a gap in the distribution map. The specimens of *Gastrocopta holzingeri* are peculiar by the straight, horizontally entering columellar lamella, and at first I thought it a distinct species. I am figuring one of these in Land Mollusca of N. A.—H. A. Pilsbry.

Pupoides marginatus in Iowa.—The writer wishes to report the finding of a single specimen of *Pupoides marginatus* (Say) in Woodbury County, Iowa, on July 29, 1944. The specimen was alive and found on the under side of a short branch of wood about an inch in diameter. The location was Stone Park, a "wilderness" park some miles beyond Sioux City; the probability of introduction could be quickly ruled out. This species has been regarded as rare in northern Iowa, chiefly because it has not been found previously by the writer in more than thirty years' collecting in the northwestern corner of the state. Many years ago he had found it at the base of the hills along the Missouri River in Kansas, and invariably on the underside of loose shale slabs lying on the ground. It is one of the very few snails which the writer has found under stones.

This species has been previously recorded for Iowa in the following published reports: For Scott County by Pratt (1876); for Johnson County by Pilsbry (1882), and by Keyes (1888); for Muscatine County by Witter (1883); for "eastern Iowa" by Shimek (1888–90); for Fremont County by Shimek (1894); for Dickinson County by Shimek (1915); for Clayton County by Shimek (1922); and for Story County by Jones (1941).—T. C. Stephens, Sioux City, Iowa.

Litiopa melanostoma Rang, A correction of distribution.—Included with the nomenclatorial remarks on the name *Litiopa melanostoma* Rang published by the author in Nautilus [1] was the statement that the distribution as used by authors did not embrace the complete range [Newfoundland] of the species as stipulated in the original description [2] of the genus and species. I have now found the obscure notes which were appended to Lesson by M. Bélanger,[3] the discoverer of the mollusk. M. Bélanger explained that the data which Rang recorded in regard to the distribution of *L. melanostoma* had been written from memory, and places and events had been confused. To translate from Bélanger: ". . . I never found Bombyxinus [4] [*Litiopa*] in the seas of Newfoundland as M. Rang said in his notice upon the genus Litiopa. I had read my observations upon this interesting mollusk to M. Rang, on my return from Newfoundland. . . ." Therefore the author's remarks, as well as those in the original description of *Litiopa,* in regard to Newfoundland need not be considered.

Bélanger discovered specimens on June 26, 1826, lat. 24° 32′ N., long. 35° 14′ W. Paris meridian; on June 28 and 29, lat 23° 38′ N. and 23° 3′ N., long. 38° 29′ W. and 39° 40′ W. Paris meridian; on July 8, lat. 20° 3′ N., long. 62° 27′ W. Paris meridian and on August 27, lat. 27° N., long. 72° W. Paris meridian. The June material would be located about in the middle of the At-

[1] Palmer, K. V. W., Nautilus, vol. 55, No. 4, 1942, pp. 128–130.

[2] Rang, P. S., Ann. Sci. Nat., vol. 16, 1st ser., 1929, p. 307.

[3] Lesson, R. P., Illustrations de Zoologie (no pagination), 1831, Appendix by Bélanger, sign. 14.

[4] Bélanger proposed in the article the generic name, *Bombyxinus,* for the form. That name was, however, preceded by that of Rang in the aforementioned work.

lantic Ocean, west of the Cape Blanco region of Africa. The July specimens came from about 150 miles northeast of the Leewards and the August collection was made about 300 miles northeast of the Bahama Island.

This was apparently the material which was the subject of Rang's promulgation in 1929 of his observations on the genus and species.—KATHERINE V. W. PALMER.

VENUS MERCENARIA NOT AT CAPE ANN.—Dr. William J. Clench has questioned the record of *V. mercenaria* L. included by the writer with species collected from Cape Ann, Massachusetts, and published in THE NAUTILUS 56: 60 and 57: 67. A careful check on the matter has disclosed that such a record is erroneous. Shells of this species have been collected from the beaches, but they were undoubtedly discarded shells, and no living specimens have yet been found. Dr. Clench has written, however, that specimens of this clam have been taken at several isolated localities north of Cape Cod, and also north of Cape Ann.—RALPH W. DEXTER, Kent State University, Kent, Ohio.

MEMBERS OF THE AMU. are requested to give the Secretary, Mrs. Robertson (136 Buffum St., Buffalo 10, N. Y.), a memo. of their activities during 1944, conchological and otherwise, for her information and use in the Annual Report. It is expected that a meeting of the Union will be held in 1945.

THE DALL BIBLIOGRAPHY is reported by Dr. Bartsch to be almost completed. Under present conditions the printing may be somewhat delayed, but it is hoped that AMU. members may have it before many months.

PUBLICATIONS RECEIVED

THE NATURALIST'S LEXICON. By Robert S. Woods, Abbey Garden Press, Pasadena 16, California. Price $2.75, postage in U. S. A. 7¢. 300 pp. This book contains a list of 15,000 words used or suitable for use in biological nomenclature, and is designed to facilitate the intelligent and efficient use of Greek and Latin terms by taxonomists and professional biologists, as well

as to make readily available to students and amateur naturalists the meanings and correct pronunciations of scientific names. The nine-page Introduction briefly states the function of scientific names and explains the rules of word-formation and pronunciation. The following pages comprise a pronouncing list of classical Greek and Latin words used or usable in biological nomenclature, together with their derivations and meanings.

On the Generic Relationships of Certain Californian Xerophile Snails. By S. Stillman Berry. Trans. San Diego Soc. Nat. Hist. 10: 1–22, 8 figs. in text, 2 plates, 1943. Snails of the Californian deserts are still imperfectly understood; some have been rarely collected alive, and they have very similar, singularly non-committal shells; few have been dissected. In this paper Dr. Berry describes and figures the genitalia of several species. The little snail described as *Micrarionta micrometalleus* Berry proves to be a *Sonorella,* extending the range of that genus far to the west. A new subgenus, *Mohavelix,* instituted for it, seems to have no anatomic peculiarities, but differs by the embryonic sculpture of the shell. The genus *Sonorelix* is proposed for *Micrarionta borregoensis* Berry, *ora* Willett, *rixfordi* Pils. and *avawatzica* Berry; and several other species are transferred to it provisionally from their conchological resemblance. These species were included in *Micrarionta* (*Eremarionta*), continuously from p. 251 to 262 in the N. Am. Land Mollusks, vol. 1, 1939. The new genus has genitalia practically as in *Eremarionta* except that a dart apparatus is completely lacking. The spermathecal duct has a short diverticulum, as in *M.* (*Eremarionta*) *wolcottiana. Sonorelix* is, in fact, a degenerate branch from *Eremarionta,* but unless species of intermediate structure are found, it may well be given generic rank. Dr. Berry has done a real service to science in the discovery and description of important diversity of structure in this difficult group of snails.

The creation of synonyms in taxonomy is everywhere deprecated, but synonyms in anatomic terminology are equally useless lumber. I refer to the new term "epiphallic caecum," used for what all mollusks anatomists for a century have called the "flagellum."—H. A. P.

THE NAUTILUS

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GREAT SLAVE LAKE

By JOHN OUGHTON [1]

Royal Ontario Museum of Zoology, Toronto

It was early June and at last we were on our way down the Athabaska River. Our duffel was stowed away in the hold of our barge just behind the chicken coop. Waterways, the ramshackle little railroad terminus, was already out of sight. There was little variety in the banks, spruce, poplars and willows being the usual covering. Dwellings were very scarce.

It is time to take stock. We five passengers on this freight barge were all employed for the Northwest Fisheries Investigations of the Fisheries Research Board of Canada. Professor V. C. Wynne-Edwards and Dr. Ronald Grant were charged with making a reconnaissance study of the fish of Mackenzie River itself between Great Slave Lake and the Arctic Ocean. They were to travel in a freight canoe, propelled by an outboard engine. Peter Larkin, Elmer Reich and myself were going to carry on a more intensive study of Great Slave Lake fish under the direction of Dr. D. S. Rawson, who had gone ahead by plane to make arrangements.

Our ship or flotilla consisted of three barges, lashed side to side and pushed by a river boat, the "Beaver Lake." Altogether we cut a swathe of water about ninety feet wide. Our load was of 450 tons, which comprised—a great amount of refrigerated meat; many cases of canned foods; some hardware and furniture; 14 canoes, 6,000 gallons of gasoline; and the following livestock on the hoof: 10 cows and 1 calf, 1 horse, 46 pigs and several sheep. These were attended by a veteran cowboy and his assistant.

Except for the smells of our fluviatile barnyard, we travelled comfortably, even luxuriously. We had lots of space, plenty of

[1] Published by permission of the Fisheries Research Board of Canada.

food and no definite duties. In fact, we had most of the advantages sought for in a deluxe cruise, without the bugbear of tuxedos and retired dowagers. It was restful to sit and gaze around as the ship pushed on northwards. Tiring of this, we could roam about the decks or catwalks, explore the holds or play cribbage.

Captain Alexander looked down on us from the top of the wheelhouse. Occasionally he would signal to us and then make some comment on the river and its life. "Right here," he said in his booming voice, "right where we are passing over now, is the site of Peter Pond's fort. Used to be on the right bank but the river cut in to that side. I guess old Peter was a tough 'un. They say he would just as soon shoot a man as look at him."

Captain Alexander himself could be taken as the prototype of all rivermen. He was browned and sturdy in his comfortable, sloppy clothes, and looked more like a farmer than a ship's officer. The river had a strong hold on him. For many years he had taken boats up and down these waters. A man had to have a sharp eye and ready hand to be a pilot; and a retentive memory to file the details that continually changed. He had observed many changes in the river; cutting here and building there; the willows extending out on the new delta deposits. Towards his adversary, the river, he had an air of confidence tempered with respect. "Give me three feet of water and a bit of current," said he, "and I could take this boat straight to hell itself." Inescapably the Mississippi and the river pilots in their heyday, as described by Mark Twain, came to mind. The two rivers so widely separated had much in common. Both were powerful giants carrying a great, silty load. In both, the channel might be altered overnight. On the Mackenzie system, the rivermen have the phrase of "reading the waters," i.e., deducing the course from many small clues.

At the Athabaska delta, the barges were tied up to shore for a few hours while the "Beaver Lake" pushed on to explore the shallows. The delta proved to be a good collecting spot, but suffered from one obvious defect. We had been left beside a big fish gut dump. This, combined with the efforts of our co-passengers, the poultry and live stock, was almost too much

for the human nose. Fortunately, we had to endure this smell for only a few hours; then our tug pushed us on across Lake Athabaska. Its northern shore was of undulating, glaciated pre-Cambrian rock; the first touch of home in this unfamiliar northwest. We stopped briefly at Fort Chipewyan to unload meat and on into the Peace River for a few miles. We met much charred wood from some distant bushfire. Reaching the Slave River proper, we continued down it as far as Fitzgerald, where we left the "Beaver Lake." I have only two impressions of this little village of extreme northern Alberta. First, the great swarms of mosquitos. Vainly I tried to sleep inside my insect collecting net, but the mosquitos crept in to defeat my rest. Elmer and I got up very early and walked along the wagon road, eventually seeing part of the rapids we could hear roaring through the bush.

A trip of a few miles by road brought us to Fort Smith, N. W. T., a trim little town headquarters of the government service of the N. W. T. perched high on the sandy river bank at the upper end of the big rapids. To the naturalist, the pelicans which live on the rocks in the swift water are of great interest. It is a strangely beautiful bird. In flight it is deliberate, its head comfortably disposed. Much of the time the pelicans patiently sit in small, white, sedate groups on a rock in the very centre of the rapids. They seem to be doing nothing, but perhaps, like human anglers, they are discussing the recent poor fishing, the new bag limit, or the high turbidity. This gives the excuse for mentioning the murkiness of the Athabaska and Slave Rivers. White objects disappear from sight in their waters at a depth of one or two inches. The newcomer shudders at the thought of drinking this brown suspension the residents call water. But thirst soon triumphs over one's sensitivities. Coffee brewed from it is passable, tea a sorry-looking drink.

At Fort Smith we had more practice at waiting for boats. In fact, the field naturalist should cultivate in early life the art of filling wasted hours happily. Sometimes it is possible to do some casual collecting. More often, less virtuous employment has to be adopted. Card games that are easy and varied, such as cribbage, pinochle or "oh hell," will help. For more solitary occasions books offer the greatest solace. It is worthwhile to

carry in one's pockets one or two cheap editions of a small size. I have found out that for myself certain types of books are most enjoyable as time-fillers in the field. Two favourites are Thoreau's "Walden" and "Maine Woods." They are satisfying and unexciting as oatmeal porridge. Finally, the traveller should carry a good stock of stories, songs and tricks for group entertainment.

Dr. Rawson and Elmer stayed at Fort Smith to prepare our barge for use, while Pete and I pushed ahead in the "Guy," a Diesel-powered river tug to start our work. We spent a pleasant evening with Gus, the pilot, in the wheelhouse. Through the dark we pushed on around oxbows and past the continuous spruce and poplar forests. Outside the rain was thrashing down. Inside we were snug. Next day we reached the delta of the Slave River. Long ago the Great Slave Lake was in the form of a cross, but the southern bar has been filled in by sedimentation from the Slave River. Here to while away some time, we tried to list the states of the union. Pete easily won with two short of a perfect score. We got a lift in the R. C. mission boat to Resolution, passing through the Shyes (channels) of the delta.

The economy of the village of Resolution may be described quickly. Furs provide the income, while fish are an important food of man and sleigh dog. This little village provides several attractions. Its beaches are rich in drift shells. It is small and unambitious and able to capture one's affections rapidly. Like an old man who has passed beyond the strong urges of youth.

In ten days our barge and the rest of our group caught up with us. We slowly proceeded across the lake, working en route, and so to Yellowknife where we anchored in the inner bay.

We now had time to fully appreciate the plan and work that had gone into our barge. Of the Canolette type, it measured about sixty feet long and eighteen wide. Two cabooses placed end to end provided us with laboratory, bunkhouse and storage room for our gear. It was well suited to our programme. We sampled the Yellowknife Bay area more intensively, working out from our barge in a skiff. For more distant open-water parts we hired MacDonald's boat, the "Guy." Three aspects of limnology claimed most of our attention—soundings, fish (measurements, food, scales and parasites), and macroscopic bottom

fauna. The latter was largely my responsibility. In addition, we made physico-chemical tests of the water, sampled the plankton, and gathered data on local consumption of fish.

In the course of the summer we visited much of the lake. Of our long journey down the east arm past the many miles of sheer rock cliff before Fort Reliance is reached, or of our excursion to the west end of the lake where the Mackenzie starts, or of our trip to Rae in the north arm, I shall say no more here.

One brief visit we made up the rapids of Yellowknife River to obtain samples of the grayling—that beautiful fish which resembles the speckled trout will be mentioned at this point. Arriving here we found two women from town who were already fly-fishing. We joshed them, telling them if they wanted to see some real grayling fishing to watch us. After much labour we set out gill-net twice in the rapid waters. We caught whitefish, pike and suckers, but no grayling. Very humbly, we borrowed flytackle from our neighbours and managed to obtain our fish. The cabin we occupied was built on the slope, just at the edge of the clearing. It contained the usual odd assortment of relics discarded or accidently left behind. I noticed the following: One pair of worn but nicely embroidered buckskin gauntlets; a tobacco pouch with drawstrings; three income tax forms for the year 1934; one copy of Magazine Digest under the date of June, 1943; one coal oil lamp globe, repaired; but no lamp; one blade for swede saw, broken; one measuring spoon for powdered milk, broken; one length of fishing line; one bed made of spruce boughs, very knobbly; one ruck-sack, badly worn; another ruck-sack made from a potato bag; one wide-mouthed jar suitable for snails, complete with lid.

A few notes on the town of Yellowknife: In the main part of the settlement a great rounded mass of rock arises bearing at its summit a water tank. The chief road circles around the rim, at the water's edge. The buildings are scattered about wherever the flatness of the rock permits. The buildings and the inhabitants recall Hollywood versions of a western town. Some of the stores have the same sort of ugly false front. There are enough prospectors and diamond-drillers to make a devil-may-care crowd. Economically important already as a gold mining centre, it will probably boom after the war. Seen in some

lights the town makes a striking picture with its bold face of rock and its scatter of buildings. It is too busy and too ambitious to engage the sympathy of the transient.

In the early part of the summer we had almost continual daylight. In fact, it wasn't until early August that I saw the stars in the sky. It was almost re-assuring to have this familiar scene restored.

For those subscribers of the Nautilus who have come to expect some conchological information in every article, I append these brief lists. These are only tentative identifications, and deal with one part of the collections. Dredgings and leaf mould samples should yield much valuable data.

Valvata sp., Great Slave Lake.—Resolution, delta of Slave River, near Gros Cap:—*sincera* or—*lewisi?* here, I cannot make up my mind. I would be glad to have the opinion of anyone claiming competence in handling this group.

Amnicola emarginata (Küster) seems to be the common amnicolid of northwestern Canada, G. S. L.—Resolution.

Lymnea stagnalis L., G. S. L.—Resolution; Yellowknife Bay; near Gros Cap.

Stagnicola palustris (Müll), G. S. L.—Delta of Slave River; near Gros Cap; pond near Rae.

Stagnicola catascopium (Say), G. S. L.—Resolution; Taltheli Narrows (spire of this lot is short and squat).

Helisoma trivolvis (Say), G. S. L.—Pond near Rae; near Gros Cap.

Helisoma anceps (Menke), G. S. L.—Yellowknife Bay.

Planorbula armigera (Say), G. S. L.—Delta of Slave River. I have seen none of Dall's species, *P. christyi* yet.

Gyraulus sp. (large), G. S. L.—Near Gros Cap; Yellowknife Bay.

Menetus exacuous (Say), G. S. L.—Near Gros Cap.

Physa gyrina (Say), G. S. L.—Resolution; near Gros Cap.

Succinea spp. Some specimens resemble *S. retusa* of the east, others our *S. avara:* G. S. L.—near Gros Cap; delta of Slave River.

Zonitoides arboreus (Say). Fort MacMurray, Alberta; G. S. L.—Delta of Slave River.

Euconulus fulvus (Mull.), G. S. L.—Yellowknife Bay.

Discus cronkheitei (Newc.). Periphery well rounded, G. S. L. —Gros Cap; delta of Slave River.

Deroceras gracile Raf. Fort MacMurray, Alberta; G. S. L.— Reliance.

Cochlicopa lubrica (Müll.). Fort MacMurray, Alberta.

Vertigo modesta (Say), G. S. L.—Delta of Slave River.

Lampsilis siliquoidea (Barnes). Not typical of this species; flattened shell and short broad pseudocardinals suggest *radiata*— G. S. L.—Rae.

Anodonta kennicottii Lea, G. S. L.—Rae: one of the type localities for this species is Fort Rae, the earlier site of which was a few miles to the south of the present settlement.

Sphaerium spp., G. S. L.—I found some large shells near Gros Cap, and at Resolution.

I returned to Edmonton by aeroplane. We were late in taking off. Already the sun was setting by the time we had winged away high over the lake. For the first time I was able to see the multitude of lakes lying inland. So strangely still the surface of the lake seemed until I realized that the white specks were the crests of waves. In the gathering darkness we passed over the delta and began to follow the Slave River southwards. For many miles we traced out long streaks of smoke until they ended in bright red and orange flames. The haunting sweetness of the bush smoke penetrated even into the cabin. Suddenly I remembered to look back at the lake, but it was already out of sight, buried in the dark and clouds. The plane roared on towards Edmonton and home.

PERUVIAN LAND MOLLUSCA—IV: CLAUSILIIDAE

By HENRY A. PILSBRY

The description of mollusks collected by F. W. Weyrauch is continued from p. 30.

It may be in order here to correct errors in the description of a Peruvian *Nenia*.

NENIA PAMPASENSIS (Pilsbry).

Clausilia (Nenia) pampasensis Pilsbry, 1910, Proc. U. S. Nat. Mus. 38: 181, fig. 4.

On page 182 the second line should read: grooved above by the suture. Eleventh line: for *lamella* read *lunella*. I saw no proof of this description.

NENIA ACOBAMBENSIS, new species. Plate 3, figs. 3, 4.

The shell is decollate, subcylindric, but with weakly convex lateral outlines; rather thin; dark vinaceous brown with more or less whitish over-wash; only lightly and very faintly striatulate, the striae showing mainly close to the suture, except on the base and the last half of the last whorl, where there are very fine, close striae, more prominent at the base, weak or disappearing upward. The summit is rather broadly truncate, the breach closed by a convex or somewhat tongue-shaped plug. The 5⅓ to 6⅓ whorls remaining are weakly convex to the last, which is shortly free in front, somewhat flattened laterally, the base rounded (or quite indistinctly subangular). The pyriform aperture is dark brown within, the peristome thin, well expanded, whitish at the edge. The superior lamella is rather small and short, concave towards the sinulus, and the very low spiral lamella connects with the left side of the superior lamella close to its inner end. Inward the spiral lamella penetrates only slightly beyond a dorsal position. The inferior lamella is receding, very inconspicuous in a front view. Subcolumellar lamella is deeply immersed, terminating contiguous to the lower end of the lunella. The principal plica is dorsal, being very short, hardly a fourth of a whorl long, penetrating no deeper than the lamella. The lunella is very strong, dorsal in shape like a figure 7 with the angle somewhat rounded, the vertical portion straight, about twice as long as the entering upper portion into which it curves. The clausilium is rather strongly arcuate at the palatal edge, the columellar edge nearly straight. It is thickened at the narrowly rounded end.

Length 17 mm., diameter at penult whorl 5 mm.; 5⅓ whorls. Type.

Length 15.1 mm., diameter at penult whorl 3.7 mm.; 6⅓ whorls.

Acobamba, near Tarma, Peru, 3000–3400 meters elevation. Type and paratypes 180032 ANSP.

Figure 3 is one of the smallest examples, somewhat abnormal by the contraction of the last whorl.

NENIA QUADRATA BOETTGERI, new subspecies. Plate 3, Figs. 1, 2.

The shell is decollate, fusiform-cylindroid, the lateral outlines moderately convex; rather thick; dull carob brown. The surface is mat, with sculpture of extremely fine, close, hairlike striae, which in a short space below the suture are somewhat unequal, coarser and whitish. On the back and free portion of the last whorl the striation is coarse and strong. The summit is closed by a convex plug as usual. The whorls are rather weakly convex, the last flattened laterally, free and descending in front, the back having a deep, curved furrow in the middle, and a shallower concavity on the left, a prominent rounded ridge between them. The broadly ovate aperture is nearly as wide as long, dark colored within, the peristome broadly reflected its face white and rounded, thickened within. The superior lamella is rather small, concave towards the sinulus, continuous with the spiral lamella, which is lower, its inner end converging towards the inferior lamella. From the point of union of the superior and spiral lamellae a short but distinct branch issues inward, lying between spiral and inferior lamellae. The inferior lamella is receding, small and inconspicuous in front view. Subcolumellar lamella immersed, its termination contiguous to the anterior end of the lunella. The principal plica is short, penetrating only a little beyond the lunella. The lunella is long, very strongly curved, forming almost a semicircle.

Length 22.7 mm., diameter at penult whorl 6.2 mm.; 5⅔ whorls.

Length 25 mm., diameter at penult whorl 6 mm.; 6½ whorls.

Length 20.5 mm., diameter at penult whorl 5.4 mm.; 6 whorls.

Carpapata, Rio Tarma, Peru, 2200–2300 meters elevation. Type and paratypes 180035 ANSP.

This form is no doubt related to *N. acobambensis,* but is larger, more solid, with broader peristome, and it differs especially by the deeply sulcate back of the last whorl.

While this form agrees with the description of *N. quadrata* Boettger (Nachrbl. deutsch. Malak. Ges. 12: 111 in most respects, there are some discrepancies. My shells do not appear to have the sculptural feature described for *N. quadrata* as follows: "Anfr. ultimus prope aperturam ad suturam rugulis quasi papilliformibus paucis, parum validus ornatus. The principal plica does not converge towards the suture anteriorly in my shells, and the rather long, strongly developed lunella would hardly be referred to as in Boettger's sentence: "[Plica] princi-

palis brevis, cum sutura antice convergens, ultra lunellam subdorsalem, hamiformi-angulatum, breviusculam non producat." Boettger did not mention the short lamella lying between spiral and inferior lamellae.

NENIA WEYRAUCHI, new species. Plate 3, fig. 5.

The shell is entire, slenderly fusiform, thin, cartridge-buff to dull whitish. Surface is finely striate, the striae uneven, stronger near the sutures, many interrupted, with short ones intercalated; at the base and for a short distance behind the peristome they are stronger. The apex is obtuse, first two whorls smooth. Spire attenuate, its lateral outlines somewhat concave in the upper third of the length. The whorls are slightly convex, the last flattened laterally, free in front, the suture continued as a groove on the neck, the base rounded, but its curvature is a trifle irregular. The aperture is light brownish within, the peristome white, reflected, slightly thickened within. The superior lamella is rather small in front view, but high within and directly continuous with the spiral lamella. The inferior lamella is receding, inconspicuous in a front view and seen from the back to be strongly thickened near the lower end. The subcolumellar lamella is immersed, terminating close to the anterior end of the lunella. The principal plica is short, running from a dorsal position (it penetrates slightly beyond the lunella) nearly to the expansion of the lip. The lunella is slightly curved, strongest near the anterior end, and with a rather low and not long portion running inward at the upper end.

Length 19 mm., greatest diameter 3.2 mm. 12½ whorls.
Length 16 mm., greatest diameter 3 mm. 11½ whorls.

Ninabamba, near Ayacucho, Peru, 1900 meters elevation. Type and paratypes 179998 ANSP.

In the irregular striation this species resembles *N. acobambensis*. The receding inferior lamella and other internal structures are also rather similar, though the lunella is less strongly developed. In size and slender form at least it appears near to *N. filocostulata* (Lubomirski) and *N. jolyi* (Boettger). These are both decollate species; all the specimens seen of *N. weyrauchi* are entire.

NENIA EKA, new species. Plate 3, figs. 7, 7a.

The small shell is entire, fusiform, thin, light brown; finely striate, the striation somewhat coarser on the latter part of the

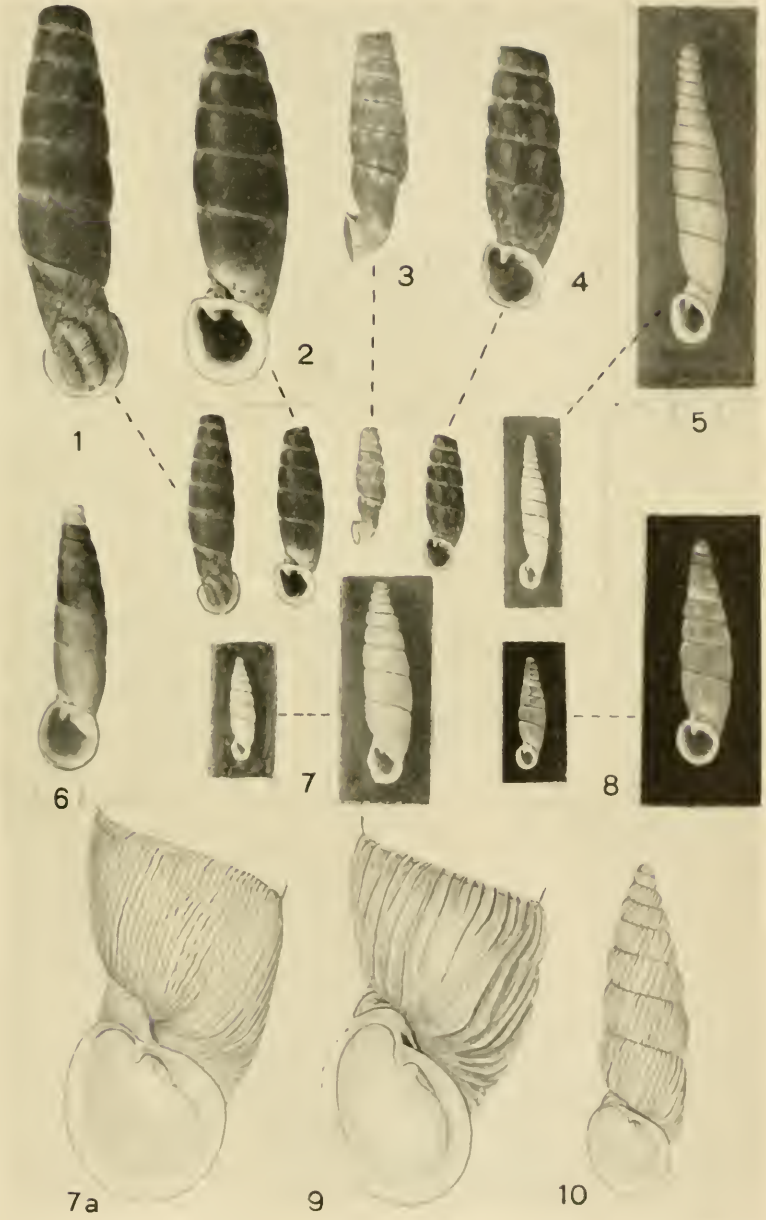
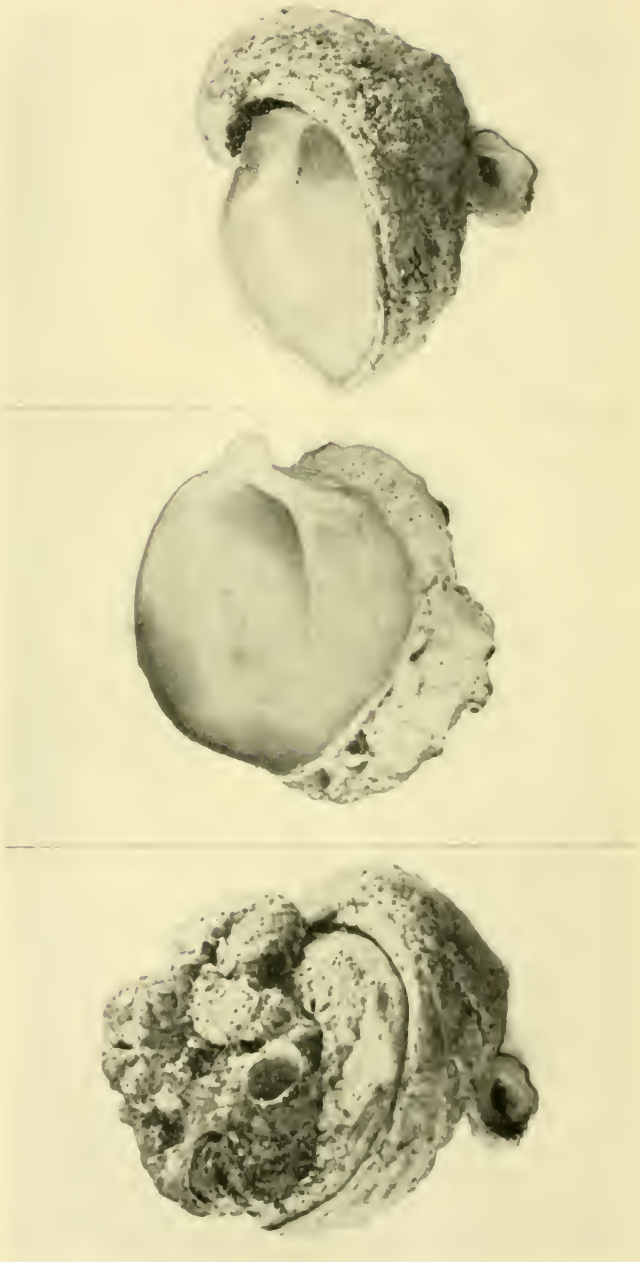


FIG. 1, 2, *Nemia quadrata hoffgeri*. 3, 4, *N. acobambensis*. 5, *N. weyrauchi*. 6, *Peruvia flachi bradina*. 7, 7a, *Nemia eka*. 8, *N. angrandi urubambensis*. 9, 10, *N. minuscula*.



Pseudochama inermis (Dall).

last whorl. Surface matt except at apex which is glossy. The whorls of the tapering upper third are strongly convex, but the last two or three only weakly so. The last whorl is somewhat compressed laterally and shortly free in front, the base rounded. The aperture is pyriform, light inside. Peristome thin, expanded and reflected. Superior lamella small, continuous with the spiral lamella. Inferior lamella receding, low and inconspicuous in a front view, but becoming strong and thickened within. The subcolumellar lamella is immersed, terminating about opposite the anterior end of the lunella. The principal plica is about a half whorl long. Lunella is dorsal, nearly straight, the upper end abruptly turned inward.

Length 12.4 mm., diameter 3 mm.; 9⅓ whorls, type.

Length 10.8 mm., diameter 2.9 mm.; 9 whorls.

Acobamba, near Tarma, Peru, 3000 meters elevation. Type and paratypes 180034 ANSP.

Nenia minuscula, new species. Plate 3, figs. 9, 10.

Included in the lot of *N. eka* there were two broken specimens which have sculpture so different from that species that I think they must be specifically distinct. The shell is similar to *N. eka* in size and in apertural armature, but it differs by the dark brown color, and the sculpture. After the first two smooth whorls it has rather strong but unequal riblets, unevenly spaced, usually separated by wider intervals and coarser on the last half whorl.

Length 11.2 mm., diameter 3 mm; 8½ whorls.

Acobamba, Peru, 3000 meters elevation. Type and paratype 180033 ANSP., both figured.

Nenia angrandi urubambensis, new subspecies. Plate 3, fig. 8.

The shell resembles *"Clausilia" angrandi* Morelet in appearance. It is fusiform, entire, dark purplish brown, sculptured with close, fine white striae about as wide as their intervals, slightly irregular and often interrupted, a trifle coarser on the back of the last whorl. The last whorl becomes shortly free, and at the base there is a rather inconspicuous impression on the back, running to the expansion of the basal lip. The thread-like striae pass unchanged over this impression. The aperture is rather broad, roundly ovate, light brown within. Peristome broadly expanded, light brown. Superior lamella vertical, rather strong, inferior lamella receding, not visible in front view.

Length 14 mm., diameter 3.2 mm.; 10 whorls, type.
Length 12 mm., diameter 3 mm.; 9⅓ whorls.

Huadqueña Vilcanota Valley, 1500 meters (the head of Urubamba Valley), Peru. Type and paratype 180029 ANSP.

While these shells agree in the main with Morelet's account, there are discrepances which indicate a different species or at least subspecies. He writes of *C. angrandi:* "Il porte un carène dorsale assez fortement crénellée par les stries que vont y aboutir." This could not be said of our shells. The locality for *C. angrandi* was "Maraynioc, dans la montaña de Tarma."

Peruinia flachi bradina, new subspecies. Plate 3, fig. 6.

This form has the light color (pale cinnamon) of *P. peruana* (Troschel), but the more slender shape and nearly flat whorls of *P. flachi* (Boettger), which is decidedly smaller.

Length 35 mm., greatest diameter 7.3 mm.; 8 whorls.

Oxapampa, Peru, 1600 meters elevation. Type 17999 ANSP.

The upper two whorls in the figured type are empty and there is evidently a septum at a later stage, so that if normally broken back it would be slightly over 32 mm. long, with 6 whorls.

The size of *P. flachi* given by Boettger is 24–25½ × 6½ mm., 5½ to 6 whorls.

SOME AMERICAN ACHATINIDAE

By H. Burrington Baker

This is part 10 of a series on Mexican mollusks, which were collected for Dr. Bryant Walker in 1926. The dissections, on which it is based, were made about 15 years ago, but publication was deferred because additional and better material was being obtained in Jamaica and Puerto Rico. However, since some of the data have already crept into print, a preliminary resumé of the following groups may not be out of place.

Leptinaria Beck, 1837, Index Moll., p. 79; type (only vested species) *Leptinaria unilamellata* ("Fer." Orbigny) from Bolivia.

Opeas Albers, 1850, Die Helic., p. 175; type first selected by Martens, 1861, Die Helic., ed. 2, p. 265, *Stenogyra goodalli*

(Miller) = *O. pumilum* (Pfeiffer) from Cuba. Not *Opeas* (Albers) Fischer et Crosse, 1877, Miss. Scient. Mex. Moll. 1, p. 592; type (?) *O. subula* (Pfr) = *Lamellaxis gracilis* (Hutton) from Cuba.

Lamellaxis Strebel und Pfeffer, 1882, Beitrag Mex. Conch. 5, p. 109; type *L. mexicanus* (Pfeiffer) from Mexico.

Synopeas Jousseaume, 1889, Mem. Soc. Zool. France 2, p. 239; type *S. caracasensis* (Reeve) = *S. beckianum* (Pfeiffer) from Venezuela.

Neosubulina E. A. Smith, 1898, Proc. Malac. Soc. London 3, p. 115; type *N. harterti* Smith from Bonaire, West Indies.

Pseudopeas Putzeys, 1899, Ann. Soc. Malac. Belgique 34, p. lviii; type *P. pulchellum* Putzeys from Africa. Compare *P. egens* (d'Ailly), Odhner, 1932, Proc. Malac. Soc. London 20, p. 31, figs. 22–25, for anatomy.

Tomopeas Pilsbry, 1906, Man. Conch. 18, p. 123; type *Lamellaxis (?) layardi* (Benson) from Ceylon.

Comoropeas Pilsbry, 1906, loc. cit.; type *Lamellaxis (?) apiculum* (Morelet) from Grand Comoro.

Ochrodermella Pilsbry, 1907, op. cit., p. 327; type *O. martensi* (Dall) from Cocos Island.

Leptopeas H. B. B., 1927, Occ. Papers Mus. Zool. Univ. Mich. no. 182, p. 17; type *Lamellaxis bequaerti* (Pilsbry) from Brazil.

Connollya Odhner, 1932, op. cit., p. 36, figs. 30–32; type *C. camerunensis* Odhner from Africa.

Allopeas H. B. B., 1935, Naut. 48, p. 84; type *Lamellaxis gracilis* (Hutton) from Ceylon.

Ferussaciinae

The soft parts of the genera *Opeas, Neosubulina* and *Ochrodermella,* which somewhat tentatively are included here, all quite closely resemble those of *Connollya* Odhner (1932). Although, as Odhner decided in the case of his genus, these American groups seem more closely related to the Ferussaciinae than to the Subulininae, they are somewhat intermediate between the two subfamilies. In the true *Opeas* and its allies, the kidney is transverse, and the narrow plaits of the jaw are thoroughly cemented together. In the more typical genera of Ferussaciinae, the kidney extends farther anteriad between the hindgut and ureter, the anal lobe of the mantle glands is somewhat more prominently developed, and the jaw plaits appear to be less firmly united. In both groups, the foot has double pedal grooves. Incidentally, Thiele (1931) founded Opeatinae on the wrong *Opeas.*

Neosubulina scopulorum H. B. Baker.

1927, op. cit., p. 12, pl. 22, figs. 9–12, anatomy. Cf. *N. harterti* Smith, H. B. B., 1924, Occ. Papers no. 152, p. 87, radula and jaw.

The genus *Neosubulina* is evidently a native American group that belongs here. Its pedal grooves, although double, appear weaker than in *Opeas pyrgula.*

Opeas pyrgula Schmacker und Boettger.

O. pumilum (Pfr.), Vanatta, 1919, Naut. 33, p. 31, notes on animal.

Anatomy similar to *N. scopulorum* but pedal grooves better marked. Anal lobe of mantle glands crescentic, not markedly deflecting end of rectum. Lung about 3 times as long as its base or 5 times length of kidney, which is little over ½ as long as wide and shorter than pericardium. Uterus very short in non-pregnant animals, but may be greatly swollen by 2 large eggs with white shells. Spermathecal stalk with shorter basal swelling which scarcely protrudes from pear-shaped vagina. Penis with a short muscular sheath around base; internally with ellipsoid epiphallic sac less than ¼ as long as penis proper and with almost no penial papilla. Columellar retractor gives off: (1) almost immediately, a heavy left retractor, which soon divides into buccal and left free retractors; (2) some distance below, the right free retractor and (3) continues as broad tail fan, from which arises long penial retractor. Each free retractor gives off: (1) lateral muscle to sides of foot (right one also to cloaca and around penis); (2) inferior tentacular and (3) continues as eye retractor (right one through penioviducal angle). Jaw evidently composed of numerous narrow overlapping plates, with denticulate margins, but are well cemented together (as in *Neosubulina*). Radular formula 10 + 8 + 1 + 20, with 71 transverse rows; teeth very similar to *O. pumilum.*

The dissected animals (ANSP. 44024) were obtained by the late E. G. Vanatta from his yard in Philadelphia, May 22, 1919. The shell of *O. pyrgula* has less arcuate growth-wrinkles and much stronger spiral striae than does that of *O. pumilum.*

Opeas pumilum (Pfeiffer)

O. goodalli (Miller) Pilsbry, 1906, op. cit., p. 200, pl. 28, figs. 72–74. *O. pumilum* H. B. B., 1927, op. cit., p. 8, pl. 21, fig. 3; radula from Tabasco, Mexico.

Animal similar to *O. pyrgula* but details of foot obscured. Kidney almost as long as pericardium. Uterus greatly stretched by 3 large, white shelled eggs in one example; another contains one embryo with 1.5 whorls inside a shell. Spermathecal sac lemon-shaped; base and vagina less enlarged. Penis relatively more elongate, with retractor arising from connective tissue over tail fan.

Unfortunately, *O. pumilum* is the type species of the genus *Opeas* and may change its name again to *O. hannense* (Rang). Even more unfortunately, "*Opeas gracile,*" which generally has been accepted as the type species, is only distantly related. I owe the dissected animals to the kindness of Mr. Hugh Watson, who collected and sent me two lots of animals from the Botanic Gardens, Cambridge, England; all the shells represent the form with the large apex (Pilsbry's fig. 74). The snails succumbed during their sea voyage, and the animals were swollen and macerated.

Ochrodermella pittieri (Martens)

Ochrodermella sp., H. B. B., Man. Conch. 28, p. 207.

Foot small, rounded posteriad, with well marked pedal grooves and coarse tessellation. Pallial complex similar to *Neosubulina* but lung about 4.5 times as long as its base or 5 times length of kidney, which is slightly longer than broad, more incurved along ureter, and has more extensive lobe between hindgut and ureter. Jaw much as in *Opeas pyrgula,* but relatively heavier. Radular formula $19 + 9 + 1 + 28$, with 109 rows; teeth similar to those of *Opeas pumilum,* but central practically unicuspid and other teeth squarish.

The animals dissected were collected near Chatham Bay, Cocos Island, by Dr. Pilsbry on the Gifford Pinchot Expedition.

Subulininae

Apparently many or most of the species usually included in *Opeas* belong in this subfamily and are placed temporarily in the genus *Lamellaxis.* Since my dissections were made, Odhner (1932) has shown that much of the anatomy of *Pseudopeas egens* (d'Ailly) is very similar to that of *Lamellaxis,* although he does not describe the origin of the penial retractor or the position of the right eye muscle. What is here called the epiphallus appears to be represented in his figure 25 by the thick

walled sac at the left of the penial apex, while my appendicular caecum seems similar to the thin walled sac on the right side.

The following key defines *Lamellaxis* and the closely related genera *Leptinaria* and *Synopeas:*

A. Right eye retractor in penioviducal angle; penial retractor arising from (or near) tail retractor; outer teeth of radula multicuspid.
B. Penial apex bifid, with caecum along side of epiphallus, near apex of which vas deferens enters; radular laterals tricuspid; shell without parietal lamella
Lamellaxis S. & P.
BB. Penial apex simple, but with vas entrance near middle of epiphallus; outer laterals bicuspid with aculeate mesocones; shell with parietal and extensive columellar lamellae at some stage ..... *Leptinaria* Beck.
AA. Right eye retractor free from genitalia; penial apex simple with vas entrance near apex of epiphallus; penial retractor arising from right free retractor; radular teeth quite consistently tricuspid; shell stout and closely coiled
Synopeas Jousseaume.

Lamellaxis *(Allopeas)* gracilis (Hutton)

Opeas gracile H. B. B., 1927, op. cit., p. 7.

Animal similar to *Leptinaria unilamellata,* but foot relatively small, although also with only one irregular pedal groove. Lung about 4.5 times as long as its base or 4 times length of kidney, which is over 1.5 times its base or 1¼ times length of large pericardium. Ovotestis of 5 lobes. Talon very shortly recurved. Carrefour quite long. Uterus more elongate, swollen by 4 to 10 large, white shelled eggs. Spermathecal sac fusiform. Vagina swollen. Vas deferens entering apex of epiphallus. Penis slender with enlarged apex when extended, but capable of almost complete retraction into heavy basal sheath that receives branch of right lateral retractor; epiphallus terminating in short vergic papilla; appendicular caecum (along side of epiphallus) lanceolate, with thick tesselate wall and with apex some distance below that of epiphallus. Penial retractor connected by anastomosing fibers with right lateral muscle; inserting on loop of vas and on apices of both epiphallus and appendix. Atrium opening about midway between base of right ommatophore and anterior margin of visceral stalk. Columellar retractor gives off left retractor near origin, right one shortly below, and spreads out into tail fan, which gives off penial retractor. Left retractor gives off heavy buccal muscle near root of tail and divides into

left ommatophoral, inferior tentacular and a few weak bands to side of foot. Right one gives off tentacular retractors and spreads out to side of foot, atrium and basal penial sheath. Right eye muscle in penioviducal angle.

One dissected animal was collected near San Juan, Porto Rico, and several were obtained by Dr. W. H. Rush at Cavite, Luzon, Philippine Islands (ANSP. 84847). Interpretation of the genitalia was greatly aided by serial sections, made by Dr. Eleanor Carothers.

Lamellaxis is separated from *Leptinaria* and expanded, as a genus, to cover most of the species which have usually been included in *Opeas*. Although the simple straight columella of *Allopeas* is very different from the spirally thickened axis of *Lamellaxis* s.s., almost every integradation occurs in intermediate species, just as it does in the genus *Spiraxis*. Retention of this broad genus *Lamellaxis* seems best until the soft parts are known in the type species of the groups *Tomopeas* and *Comoropeas*, of one of which *Allopeas* may be a section.

Lamellaxis (Allopeas) mauritianus (Pfeiffer).

Animal similar to *L. gracilis* but kidney triangular, about ⅔ as long as its base and about 1⅓ times pericardial length. Uterus with 3 eggs (diam. 1.3 mm.). Spermatheca with shorter stalk and with ovoid basal swelling. Vagina with more globose enlargement, which in one animal contained 3 spermatophores with fusiform horny capsules. Penis with thinner basal sheath; lower .6 slender with internal pilasters; apical .4 swollen; epiphallus shorter and stouter than appendicular caecum, which reaches penial apex. Radular formula 22 + 17 + 1 + 39, with 97 rows; outer teeth with elongate backs, retaining tricuspid fascies although multicuspid.

Through the kindness of Dr. Pilsbry, animals from Mauritius, collected by W. F. Webb in 1906 (ANSP. 91186) have been dissected.

Lamellaxis (Tomopeas?) clavulinus (Potiez et Michaud).

Opeas clavulinum Pilsbry, 1906, op cit., p. 135. *?Subulina urichi* Smith, 1896, Jour of Conch. 8, p. 235, from Trinidad.

Animal similar to *L. gracilis* but lung about 3.5 times as long as its base or length of kidney, which is a little longer than its base or length of pericardium. Free oviduct considerably

shorter, vagina relatively larger and basal sheath of penis less extensive. Uterus may contain 4 eggs. Penial retractor arising from connective tissue above tail fan although connected with it. Penis long and slender; epiphallus .2 total length and slightly shorter than very attenuate caecum. Radular formula 25 + 1 + 25, with 87 rows; central unicuspid; laterals squarish; outer teeth mainly with tricuspid fascies but with spatulate cusps.

Mr. Hugh Watson has sent me the dissected specimens under the name of *Leptinaria urichi*. They come from the hot-houses of the Royal Botanical Garden, Edinburgh, Scotland and were collected by A. R. Waterson. They agree very closely with Dr. Pilsbry's *Opeas clavulinum*. Although the genitalia and the retention of tricuspid fascies in the outer radular teeth are more like *Allopeas,* the penial caecum is slender as in *Leptopeas*. Its unicuspid central, the cusps of its outer teeth and the origin of the penial retractor are peculiar. If the anatomy of the type of *Tomopeas* be found similar, *Allopeas* should become a section.

Lamellaxis (Leptopeas?) micra (d'Orbigny)

Opeas micra H. B. B., 1927, op. cit., p. 10, radula.

A single, badly retracted animal from Marianao, near Habana, Cuba, collected June 14, 1926, has been dissected. It is certainly that of a *Lamellaxis* but seems closer to the next group than to the preceding ones.

Lamellaxis (Leptopeas) argutus (Pilsbry).

Animal similar to *L. gracilis* but lung wall over 4 times as long as its base and less than 4 times length of kidney, which is 1¼ times its base and almost 1.5 times pericardial length. Ovotestis of two small lobes. Uterus with 3 large, white shelled eggs. Spermatheca with small sac and prominent basal swelling. Penis slender, with a loose basal investment of fibers from right lateral retractor; apical ¼ bifid; epiphallus with entrance of vas ⅓ way down and opening through low penial papilla; appendicular caecum very attenuate. Penial retractor arising from left side of tail retractor. Salivary glands slender, lanceolate and almost symmetric; ducts short. Radular formula 14 + 7 + 1 + 21, with 87 rows; laterals even shorter and broader than in *L. bequaerti;* marginals with more numerous cusps.

The animals dissected are from Córdoba (station 4) and belong to the typical form.

Lamellaxis (s. s.) mexicanus (Pfeiffer).

Animal similar to *L. gracilis* but lung wall slightly longer; kidney 1⅓ times as long as base and little longer than large pericardium. Ovotestis with 3 lobes. Uterus containing 3 or 4 eggs. Neither spermathecal sac nor base much swollen. Penis more slender; epiphallus .4 total length, with prominent conical penial papilla; lower .6 with heavy pilaster; caecum very slender but as long as epiphallus. Radular formula is 19 + 8 + 1 + 27, with 77 rows; laterals with more prominent entocones and less aculeate mesocones than in *L. martensiana;* outer 15 teeth approach comb-like shape of *Leptopeas.*

The dissected animals come from above Necaxa (station 34). The anatomy is very similar to that of *L. argutus.*

Lamellaxis martensi (Pfeiffer).

Animal similar to *L. mexicanus* but lung wall 3.5 as long as its base or kidney. Penis with marked swelling below base of epiphallus, which is about ¼ length of entire organ, and which opens through more distinct penial papilla. Radular formula 15 + 8 + 1 + 23, with 73 rows; 1st lateral relatively broader.

In my only animal, form *modestus* from Atoyac, the female organs are very immature but the penis is quite large.

Leptinaria unilamellata (Orbigny).

L. lamellata (P. et M.), H. B. B., 1927, op. cit., p. 22, pl. 20, figs. 100–2, pl. 21, f. 8; anatomy and radula.

My earlier drawing (fig. 100) of the penis shows the entrance of the vas deferens too low; it actually runs up the side of the epiphallus and opens into the latter near the middle of its length.

Synopeas beckianum (Pfeiffer).

Opeas caracasensis Str. & Pfeffer, 1882, op. cit., p. 101, anatomy (largely incorrect). *O. beckianum* H. B. B., 1923, Occ. Papers no. 135, p. 8, pl. 1, fig. 6, radula.

Animal similar to *Lamellaxis gracilis* but foot relatively large; lower pedal groove well impressed. Right and left neck-lappets more prominent. Lung 6 times as long as its base. Ovotestis of 4 lobes; talon tongue-shaped. Uterus containing 5 eggs, which are relatively smaller. Free oviduct and vagina slender.

Spermatheca with obovoid sac and slender stalk. Penis slender, fusiform; basal sheath reduced to investing fibers from right lateral muscles; epiphallus almost ⅓ length of penis, similar to that of *L. argutus;* appendicular caecum absent; penis proper with heavy pilasters. Penial retractor arising from right free retractor just above division of same. Atrial opening near anterior edge of visceral stalk. Right eye retractor free from genitalia.

The animals dissected come from around Córdoba and are very large obese examples. *Synopeas* appears to be a very distinct genus.

DESCRIPTION OF NEW SPECIES OF ACMAEA.

By AVERY RANSOME (GRANT) TEST

University of Michigan, Ann Arbor, Mich.

The study during which these species were examined and described was made at the University of California, under the guidance of Professor S. F. Light, to whom I want to express my great gratitude. The shells were in part collected personally, in part loaned by the United States National Museum, the Stockholm Riksmuseum, the Zoologisches Museum der Universität, Berlin, and the California Academy of Sciences, San Francisco, California.

Acmaea cona, new species.

Apex near anterior third of shell, erect, highest point of shell. Lateral and anterior faces plane or slightly convex. Sculpturing of roughly rounded ribs, often branched, irregularly spaced, with a suggestion of spines near the apex. Interspaces usually wider at margin than ribs, and often finely corded in irregular fashion. Margin crenate due to slight projection of ribs. Surface of interior highly lustrous, with large brown "owl" filling apical area inside muscle scar; intermediate area white, with pencil lines from exterior often showing through; border irregularly marked with brown; muscle scar not conspicuous. External color pattern of ivory ribs alternating with interspaces tinged throughout with pale verdigris streaked with ramifying pencil lines of brown, the brown lines frequently forming a network, which near the apex often is stelliform. Soft parts

of the animal with distinctive coloring, the side of the foot being white speckled with black pinhead dots (unlike that of any other species of *Acmaea* on the west coast of North America except *A. scabra*, which is similar).

Largest of type specimens 17.5 × 13.7 × 6 mm. high.

The type series is a group of 20 specimens taken personally at Point Fermin, San Pedro, California. In addition, there is a group of 124 paratypes, also taken personally at Point Fermin, and other series from the United States National Museum and the California Academy of Sciences were studied, these latter totalling 281 specimens from various localities. The type series will be sent to the California Academy of Sciences at San Francisco, paratypes to the United States National Museum.

Range (localities from which specimens were seen): Point Concepcion, San Pedro, La Jolla, San Diego, all of California; Ensenada, San Quintin, Cape San Lucas, all of Mexico; Revilla Gigedo Islands.

The ribs may be sharply defined, smoothly rounded, and very narrow in comparison with the interspaces. They may be much lighter in color than the interspaces, which are frequently gray or dark. The ribs may be completely unbranched, and frequently have no suggestion of spines. The interior may be blue in the intermediate area, and the border may be dark interrupted by white where the ribs are. The central area may be white. The external coloring may be of various patterns in gray between ivory ribs. Occasionally, the ribs also are gray. Sometimes the entire color pattern is obscured by the ravages of fungus infection.[1]

ACMAEA FOUAE, new species.

Apex in central fifth of shell, erect. All faces sigmoid, the convex curve being the lower half, the concave curve the upper half. Aperture short, oblong. Sculpturing of broad, roughly rounded, shallow ribs, widening as margin is approached, separated by narrow interspaces. Margin practically entire, somewhat blunt. Interior with dull, narrow border; lustrous, narrow intermediate area; dull, irregularly surfaced apical area of large size. Border of very broad black and white bars; intermediate area whitish,

[1] Bonar, L. 1936. An unusual ascomycete in the shells of marine animals. Univ. Calif. Publ. Botany, 19: 187–192, pl. 22.

with external broad black rays showing through as dark bluish bands; owl-shaped apical area inside muscle scar opaque, ivory white, with a few vague brownish stains. Exterior of broad dirty-white and dark gray bands radiating out from apex to margin. Upper half of shell usually badly eroded by fungus (Bonar, 1936).

Size:—Largest: 17.1 × 13.2 × 6.9 mm. high.

Nine specimens and 3 radulae loaned by Stockholm Riksmuseum constitute the type series. Type locality and known geographical range:—Foua, Tonga Islands.

The color marks may be of pale chestnut or intermediate shades, instead of black. They may be in narrow bands instead of very broad ones. Each band may be composed of many fine ones. There may not be any color bands exteriorly, only tawny internal bands being present. The intermediate area may be suffused with tawny smudges. With regard to shape, there was practically no variation among the specimens at hand. Most of the shells were heavily fungus infested, causing a rough, excavated surface, and sometimes changing the facial silhouettes. The border is crenated by very broad, extremely shallow lobes, almost or completely obsolete in most cases.

Acmaea cancellata, new species.

Apex in anterior fifth, inclined antero-ventrally; not highest part of shell. Anterior face concave; posterior face convex; lateral faces plane. Aperture long elliptical. Sculpturing of fine, close, radiating striae distinctly beaded so that the narrow interspaces appear cancellate. Margin sharply crenulate. Interior and exterior pure white. Shell tiny, fragile, translucent.

Type and only specimen: 6.5 × 3.4 × 1.6 mm. high.

Type locality: Sangaura. Type in Zoologisches Museum der Universität, Berlin, Germany.

Acmaea cornea, new species.

Apex in anterior fifth of shell, inclined anteriorly. Anterior face short, concave; posterior face long, convex; lateral faces plane to slightly convex. Aperture elliptical. Sculpturing of fine, close-set striae which pass in an undeviating line from apex to border; in addition, there are prominent concentric growth lines. Margin finely serrate. Internal surface with a lavender sheen throughout; border regular, corneous; apical area brown. Exterior of pale, corneous brown.

Type specimens: 4.6 × 3.5 × 1.3 mm. high.
4.4 × 3.2 × 1.2 mm. high.
3.5 × 2.7 × 1.2 mm. high.

Type locality: Zanzibar, Africa. Type specimens in Zoologisches Museum der Universität, Berlin.

ACMAEA ECCENTRICA, new species.

Apex at or overhanging anterior margin, strongly inflected antero-ventrally; not the highest point of shell. Aperture long elliptical. Anterior face concave, very short; lateral faces plane to barely convex; posterior face convex, long, arched. Sculpturing of fine radial striae. Margin serrate. Internal finish lustrous, pure white. Exterior white, sometimes with a few freckles of golden yellow. Shell thin, fragile, translucent.

Largest specimen: 4.3 × 2.8 × 1.3 mm. high.

The 14 type specimens belong to Zoologisches Museum der Universität, Berlin.

Type localities: Sydney and Port Jackson, Australia. "Rosto de Caô."

The only variations among the fourteen specimens available to me, and which form the type lot, were the presence or absence of the few nearly microscopic golden freckles mentioned in the diagnosis.

ACMAEA IRREGULARIS, new species.

Apex within anterior third of shell; erect. All faces convex, often irregular in outline. Aperture very irregular, usually broader at posterior end. Sculpturing of heavy, granulated ridges alternating with smaller, more finely granulated ridges, of which there may be one or more between each larger rib. Margin thick. Interior dully lustrous with broad, entire margin; dense, white intermediate area; brown apical owl. Exterior rusty black flecked with pinpoints of white, unless fungus infected, a common condition in this species (Bonar, L. 1936). Fungus infected specimens rusty, with spots and rays of black and ash irregularly distributed.

Largest specimen: 21.5 × 14.6 × 6.6 mm. high.
Another: 15.8 × 11.2 × 5.8 mm. high.

Type and only known locality: Simons Bay, Cape Colony, South Africa. Four specimens belonging to Zoologisches Museum der Universität, Berlin, comprise the type specimens.

The apex may be elevated or depressed, pointed or rounded.

The aperture may be greatly distorted, or truncate-ovate with a somewhat irregular outline. The sides, seldom alike, may be markedly arcuate. The margin, if regular enough, may be dentate, with wide interspaces between the teeth. Border may be narrow, with a fringe of brown rays extending upward into the intermediate area, or the whole intermediate area may be clouded with tan.

ACMAEA TRANSPARENS, new species.

Apex practically over anterior border; not highest point of shell; strongly inflected antero-ventrally. Anterior face concave; lateral faces nearly plane; posterior face strongly convex. Aperture elliptical. Concentric sculpturing only, of very faint growth lines. Internal border entire, sharp, and very fragile. Shell white inside and out, translucent, fragile.

Type: $3.8 \times 2.3 \times 1$ mm.

Type locality: "Australia." The 2 type specimens are the property of Zoologisches Museum der Universität, Berlin.

ANOTHER SPECIMEN OF PSEUDOCHAMA INERMIS WITH A SECOND AUTHENTIC HABITAT

BY M. E. BOURGEOIS

On page 83 of vol. 47 of The Nautilus, there is the original description of the type specimen of *Pseudochama inermis* (Dall), now in the U. S. N. M. According to the authors, this species was found and described over 60 years ago, but without authentic habitat, and does not seem to have been collected again until 1930, when Dr. H. N. Lowe found a specimen on Maria Madre Island of the Tres Marias group, which is the first and only authentic habitat previously known for this species.

In December of 1938, I spent nearly two weeks collecting at the Port of Zihuatanejo, Guerrero, which is situated on a beautiful bay, a little north of Acapulco. Not far from the main beach of the port, there is another small rocky beach, which seems to be the home of many chamas (*C. echinata*, *C. squamuligera*, *C. corrugata* and others), judging from the numerous worn specimens thrown up among the smaller rocks on the shore, and from

the valves still to be seen fastened to the larger rocks at the water's edge. To my great delight, I found among these a large closed specimen of *Pseudochama inermis* in excellent condition, except that it was rather incrusted, and there are a number of parasites fastened to the shell, among which are quite a number of smaller chamas.

As the shell has a large flat base upon which it sets very firmly, it looks when closed quite like a jewel case, the large *Vermetes* parasite fastened to the cover making a fine handle with which to lift it off.

The description of the type and of Dr. Lowe's specimen is also very good for my specimen, except that the muscle scars are without color and crystalline in appearance; but, from the muscle scars to the edge of the shell, there is in both valves a wide olive-buff margin with the exception that the superior edge of the upper valve is purple. This shows very well in the photograph, being much darker than the rest of the interior. After cleaning off much of the incrustation, both valves show clearly the thick periostracum (buff on the lower valve, dark brown on the upper), strong growth lines and spineless character of the shell. The shell measures $75 \times 49 \times 31.5$ mm., which is a little smaller than the type specimen.

Prof. I. Ancona H. of the Biological Institute of Mexico City very kindly took the three views of the shell, which are reproduced on plate 4.

MOLLUSCAN TYPES IN THE CARPENTER COLLECTION IN THE REDPATH MUSEUM

By KATHERINE V. W. PALMER

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While working on the problem of the illustration of the many unfigured types of the species of Mollusca from the West Coast of North America described by P. P. Carpenter, a considerable number of types were located at the Peter Redpath Museum, McGill University, Montreal, Canada.

The large collection of shells which Carpenter bequeathed to McGill University is on display, and with the exception of a few of the pelecypods that have become dismounted, it is in excellent condition. Except for dusting, cleaning, and the nec-

essary moving of two cases of bivalves, the collection remains as it was arranged shortly after Carpenter's death in 1877. The specimens are as Carpenter mounted and labelled them. The specimens of a species from each locality are glued on glass, the size of the glass corresponding to the size required for the specimen. The label was written by Carpenter in white ink on the glass, and it usually consists of the name of the species, the author, locality, and collector. In many cases, synonymy and special remarks are added. All the glass mounts bear Carpenter's monogram in white ink in the upper right hand corner. In the event that the specimen is a type, the label includes the word type. The types are not separated from the rest of the collection. Only those specimens which were definitely stipulated as type are included in the present list. The fortunate and important fact that the Carpenter collection remains as mounted in Carpenter's time leaves no doubt as to the authenticity of the labels. The glass mounts are arranged over black or bluish black paper which shows up the white lettering clearly. The collection is not catalogued.

The whereabouts of many of the types of the species described by Carpenter are still unknown. Such data regarding the location of the types as given in Mrs. Oldroyd's great opus (Marine Shells of the West Coast of North America, 2 vols., 4 pts., 1924, 1927) need considerable revision. Seemingly a preliminary list of the types contained in the Redpath Museum would be of service until the complete catalogue with data and illustrations can be compiled and published. The present list is a copy of the name and facts just as Carpenter wrote the label. The numbers of specimens or explanatory notes by the author are in brackets. This inventory does not intend to include any revision of the specific names as they may be interpreted today. Some of the names are manuscript names, some are preoccupied, and some have been described by later authors.

All the types in the following list have been photographed and publication of the illustrations in the future is planned when additional figures and notes have been acquired and compiled about the types that have been deposited in other institutions. At that time, revised names, references, synonymy, etc., will be recorded.

The author wishes to thank Dr. T. H. Clark, curator of the Redpath Museum, and Miss Alice E. Johannsen, assistant curator, for their splendid coöperation in regard to my examination of the Carpenter collection. J. W. Pollock, of the Zoölogy Department at McGill University, photographed the specimens of the present list and I am grateful to him for his patience and care in doing that task.

Most of the pelecypod and gastropod names will be found in Smithsonian Miscellaneous Collection, No. 252, 1872, which reprints some of Carpenter's works. Dr. Pilsbry's monumental monograph in volumes XIV and XV of the Manual of Conchology, 1892, 1893, will furnish references for the chitons.

PELECYPODA

Ostrea lurida Cpr. type Shoalwater Bay Cooper [1]
Pecten paucicostatus Cpr. type "Sta. Barbara" Jewett (? Nicaragua) [right and left valves]
P. squarrosus Cpr. type "Sta. Barbara" Jewett Also really Florida [right and left valves]
Cryptodon serricatus Cpr. type Puget Sound Kennerly [2 broken]
Myrtaca undata Cpr. type Gulf of California Pederson [3]
Lucina lingualis Cpr. type C. S. Lucas Xantus [6]
Chione undatostriata Cpr. type Todos Santos Bay Hemphill [1 valve]
Psephis salmonea Cpr. type Catalina Is. 30 fms. Cooper [5 valves]
Marcia (= Liocyma) Beckii Dall type Oringa 6 fms. Plover Bay E. Siberia Dall [3]
Donax carinatus (*versus* teste Hanl.) = *culminatus* Maz. Cat. (type) Acapulco Newberry [1½]
Donax (? *punctostriatus* var.) *caelatus* (type) Acapulco Newberry [9]
Psammotaca compacta Cpr. type S. Francisco Pease [1 specimen of both valves]
Coralliophora crenelloides Cpr. type E. Indies [1 specimen of both valves]

GASTROPODA

Mangelia angulata Cpr. (? type) Sta. Barbara Jewett [3]
M. cerca Cpr. type Panama Jewett (comp. *gemmulosa*, C.B.A. 173) [1]
M. hamata Cpr. type "Panama" Jewett [1]
M. interfossa Cpr. type Neeah Bay *Swan* [9, one definitely not the same as the others]

M. tabulata Cpr. type Neeah Bay Swan [10]
M. variegata Cpr. type Sta. Barbara Jewett [1]
M. (? *variegata* var.) *nitens* Cpr. type Sta. Barbara Jewett [3]
Oliva callospirata ms. type Sooloo Borneo E.E. [2]
Gibberula Jewettii Cpr. type Sta. Barbara Jewett [10]
G. pyriformis Cpr. type S. Diego Monterey [13]
G. subtrigona Cpr.* type Sta. Barbara Jewett Monterey [2, one marked *]
G. regularis Cpr. type S. Diego Monterey [6]
Nassa (Phrontis) venusta var. teste H.C. = *bilobata* Cpr. ms. type Pacific Is. [3]
N. (Ione) immersa Cpr. type Pacific Is. [1]
Mitromorpha filosa Cpr. type Sta. Barbara Jewett [1]
? *Anachis serrata* Cpr. (type) C. S. Lucas [4]
Astyris tuberosa Cpr. type Sta. Barbara fossil Jewett [5]
Columbella Reevei Cpr. type C. S. Lucas [5]
Tritonidea elata Cpr. type Gulf of California Pederson [1]
T. elata var. (= *Murex Fricki* Crosse type) Gulf of California Frick [1]
Monoceras paucilirata Stearns type La Jolla 12 mi. n. of S. Diego H. Hemphill [5]
Opalia bullata Cpr. type Sta. Barbara Jewett [1]
Pelatoconchus octosectus Cpr. fragment of type sp. [2]
Thalotia Ramburi Cross [Crosse] type South Australia [7]

Amphineura [1]

Lepidopleurus C. B. Adamsii Cpr. type on *Discina Cumingii* Panama C. B. Adams No. 372 [7]
L. comptus Gld. var. *patuloides* Cpr. ms. Philippines H. Cuming No. 373 [2]
Leptochiton crassus Cpr. "unique type" S. Diego under rocks in sand extreme low tide Hemphill [1]
Trachydermon gothicus Cpr. type Catalina Is. St. Barbara Is. Cooper [5]
T. perornatus Cpr. type loc. incert. Mus. Cuming No. 98 [1]
Leptoplax rubrotincta Cpr. type ? Japan (H.C.) [1]
Chactopleura armillata Cpr. type Isl. Gorriti H. Cuming No. 36 [3 plates]
C. gemmea Cpr. type Monterey Canfield [5]
? *C. Hartwegii* Cpr. type Monterey H. Cuming [3]
C. parallela Cpr. type C. S. Lucas Xantus ? = *columbiensis*, var. [1]

[1] The generic sequence of the Amphineura is according to Carpenter's classification which is given in Pilsbry, Manual Conch., vol. XIV, 1892, p. XIX.

Maugerella conspicua Cpr. type original type La Paz Pease [1]
M. conspicua type normal San Diego Hemphill Sta. Barbara Cooper (= *magdalenensis*, var. *subobsoleta* B.A. Rep.) [11]
Ischnochiton albidus Cpr. type loc. incert. H. Cuming [1]
I. antipodum Cpr. type N. Zealand H. Cuming [1]
I. aurcotinctus Cpr. type Catalina Is. 80 fms. Cooper 1071a [1]
I. cooperi var. *acutior* Cpr. type Todos Santos Bay L. Cal. Hemphill [5]
I. cooperi var. *acutior* Cpr. type Sta. Cruz Cooper False Bay near S. Diego Hemphill [6]
I. corrugatus Cpr. type Catalina Is. 40 fms. 1070 Cooper No. 1068 [1]
? *I.* (? var.) *expressus* Cpr. type Panama C. B. Adams No. 395 rare Comp. *Chaetopleura* jun [1]
I. funiculatus Cpr. type (also Krebs) Guadalupe Mus. Cuming No. 44 [1]
I. macgillivrayi Cpr. type Tristan D'Acunha M'Gillivray [1]
I. newcombi Cpr. type Catalina Is. Newcomb [2]
I. peregrinus Cpr. type loc. incert. H. Cuming [1]
I. pollicaris Cpr. type Corfu H. Cuming [1]
I. radians Cpr. type Monterey Canfield [4]
I. sinudentatus Cpr. type California [4]
I. subexpressus Cpr. type = *scabricostatus* Cooper No. 518a 20 fms. Catalina Is. [1]
Stenoplax fallax Cpr. type Brodegas Newcomb [1]
Heterozona cariosa Cpr. type Australia H. Cuming [1]
Callistochiton decoratus Cpr. type S. Diego Hemphill (comp. *veredentiens*) [12]
C. fimbriatus Cpr. type Monterey Canfield [3, one with 10 plates mounted separately]
C. pulchior Cpr. type No. 375 Panama C. B. Adams = *pulchellus* C. B. Adams non Gray (on *C. ncara* var. *Lessonii* C. B. Adams 348 [one small specimen marked *]) [6]
C. palmulatus Cpr. type Sta. Barbara Cooper No. 1077 [1]
Angasia tetrica Cpr. type Ceylon (H.C.) [1]
Hemphillia langinosus Cpr. type Todos Santos Bay Lower California H. Hemphill [5]
Chiton densiliratus Cpr. type Japan Mus. Cuming No. 16 [1]
C. limans Cpr. type Australia Mus. Cuming No. 54 [1]
C. semilaevis Cpr. type ? Australia Mus. Cuming No. 3b [1]
C. siculoides Cpr. type N. Zealand Mus. Cuming 5b = *jugosus* H. Cuming not Gld. [1]

Tonicia incurvata Cpr. type loc. uncer. H. Cuming 85 [1]
T. nigropunctata Cpr. type Society Is. ? Pease [2]
Sclerochiton miles Cpr. type Torres Str. H. Cuming No. 12 [1]
Acanthopleura incana Gld. type Figi U.S.E.E. [2]
Ornithochiton caliginosus Cpr. type = *picea* A. Ad. China Seas A. Adams [1]
Placiphora cuprea Cpr. ms. (type) N. Zealand Mus. Cuming No. 3 Rm. = *Streptochiton* [3 plates]
P. superba Cpr. type N. Zealand Mus. Cuming No. 2 [1]
Streptochiton zonulatus Cpr. type Ceylon Angas [1, plates and mantle separated]
Euplaciphora excurvata Cpr. type ? Australia Haines [4 plates separated]
Mopalia filosa Cpr. ms. type St. Barbara Cooper comp. *plumosa & acuta* [1, coiled]
Placiphorella imporcata Cpr. type Puget Sd. Kennerly [1]
P. sinuata Cpr. type Puget Sd. Kennerly [1]
Acanthochiton arragonites Cpr. type C. S. Lucas Xantus [1]
A. asbestoides Cpr. type Flinders Isl. ? Australia Mus. Cuming No. 90 [1]
A. achates Gld. type Hakodadi Ousima Stimpson [4]
A. bœticus Cpr. type Sandwich Is. Pease [2]
A. cuspidatus Cpr. type No. 77 N. Zealand Mus. Cuming No. 77 [1]
A. hispidus Cpr. type Mus. Cuming No. 89 St. Vincent Cape Verde [4 plates separated]
Acanthochiton ? hispidus var. *hirtus* Cpr. type St. Pauls Mus. Cuming No. 41 [1, plates separated]
Stectoplax gracilior Cpr. type "W. Africa" teste Gould [1, plates separated]
S. porrectus Cpr. jun type Mus. Cuming No. 97 Japan A. Adams [3 plates separated]
Choneplax serpens Cpr. type West Indies (? var.) [1]

NORMAN W. LERMOND

Norman Wallace Lermond the well-known naturalist, who once owned and operated Utopia Park, died last spring in Maine. Services were held in Thomaston. Mr. Lermond was born July 27, 1861, in Maine in Knox County's oldest house, a structure reared 176 years ago. He was rocked in a cradle which had served a similar purpose for seven generations. In front of the

house still blooms a rose tree which his grandmother planted in 1809, and bordering the orchard are hawthorn trees 220 years old. Mr. Lermond's parents were Omar W. and Rebecca (Todd) Lermond. The family traces its ancestry back to the year 1200 and was descended from the Picts. The clan was the McLermond. In the old homestead were to be seen the Lermond coat of arms, as well as the Malcolm coat of arms which came from the grandmother's side. Among the ancestors was Capt. David Lermond who was captured during the war of 1812 and placed aboard a French frigate. The latter was in turn taken by an English man o' war, and the luckless Capt. Lermond spent a long time in Dartmoor Prison.

Young Lermond attended in Hartford, Conn. a boarding school kept by a brother of Jacob Abbott, author of "Rollo's Travels" and recalls visits paid to that institution by Lyman K. Abbott and Harriet Beecher Stowe. Every Sunday he attended church where Mark Twain worshipped at that time. The boy's early education was continued in Dudley Grammar School, Roxbury, and English High School, Boston. While in English High School the boy specialized in nature studies and was the only pupil who had 100 percent in a botany examination.

The old Bartlett second-hand bookstore on Cornhill was the scene of the next chapter in Mr. Lermond's life. It was the headquarters for many noted personages, and among them Mr. Lermond met Gen. Burnside of Civil War fame and Julius Ward, preacher, author and journalist. Mr. Lermond upon leaving his position in the bookstore, spent a year in New York with a trade journal called the Boston Telegram. Next he went to the Atlantic Avenue office of the New York and New England Railroad where he served two years as accountant. He was then transferred to Lowell depot, where for two more years he kept a set of Grand Trunk books for the Railway Clearing House Association. When he made a change it was to go into the auditor's office of the New York and New England R.R. During this time, he formed the Thomaston Farmers' Exchange in 1880, and helped organize the New England Milk Association.

In 1885 he came back to the old homestead, where, except for a brief interval, he farmed until 1920. That interval carried with it a touch of romance. Imbued with the teachings con-

tained in Edward Bellamy's second book "Equality", Mr. Lermond had affiliated with a National Society known as the "Brotherhood of the Co-operative Commonwealth." He was eventually made general secretary of that organization, and placed in charge of a colony of 300 persons who were to locate on Puget Sound, Washington. Mr. Lermond first sent an agent to the West coast, entrusting him with $6,000 to be used in the purchase of the necessary tract of land. The agent bought from U. S. Senator Aldrich 600 acres from which the timber had been stripped. Much of it was tillage land with black rich loam, which promised well for agricultural operations. The colony was assembled from all over the United States, brought together by articles which had appeared from Mr. Lermond's pen in a national socialistic publication. The colonists engaged in a variety of vocations, some in lumbering, some in manufacturing barrels, and some making bread for sale to the lumbermen. A fishing vessel was bought, and the colonists caught great quantities of herring which were barreled and sold in the camps and cities. Mr. Lermond bought from a daily newspaper in Tacoma a 10-ton press which was moved laboriously to the colony's headquarters in Edison. From it was published a Socialist newspaper called "Equality." Eventually the colony became 500 strong. Some of its members remained permanently in the West. Mr. Lermond came back to his farm after an absence of five months.

In 1898 Mr. Lermond was the nominee of the People's Party for Representative to Congress from the Second District of Maine. Two years later he had passed automatically into the Socialist party and became its candidate for governor.

In 1903 Mr. Lermond opened his grove in Warren under the name of Utopia Park, and for three seasons Socialist meetings were held there. Utopia Park became known as the Knox Arboretum, a wild flower and bird sanctuary offered as a free gift to the Knox Academy of Arts and Sciences. The park embraces 60 acres. In the arboretum are 124 species of trees and 104 species of shrubs. With the arboretum firmly established Mr. Lermond launched the Maine Naturalist, an illustrated magazine devoted to the flora and fauna of Maine.

His "Catalogue of the Mollusca of Maine" was published in

1908 by the State Department of Agriculture. A shell, "Caleuf lermondi", was named for him by Dr. William Healey Dall of the Smithsonian Institution. It was collected by Mr. Lermond at Gulfport, Florida, so small it requires the use of a microscope, to bring out the pattern. Another specimen named for him is the "Pisidium", discovered by Mr. Lermond in a small pond. He knew practically every wild flower within a 20-mile radius of Boston, Mass., and was thoroughly acquainted with the natural history of his native state. He studied flora and fauna of the Pacific Coast, and in the states of Arkansas and Tennessee, and dredged for shells off the coast of Florida. He studied nature in the Bahamas and Cuba, and camped in the Everglades for a period of three weeks with a party of eminent scientists doing research work. For several months at two different times, he was assistant in the Department of Mollusks, at Harvard College. He was corresponding secretary for the American Malacological Union, which he organized 14 years ago.

NOTES AND NEWS

Changes in the Nomenclature of Two West American Marine Bivalve Mollusks.—The species named *Lucina undata* by Carpenter (Proc. Zool. Soc. London, 1865, p. 279. "Hab. Gulf of California (teste Rowell)"), requires a new name because of the prior use of that combination of names by Lamarck, 1819. The name **Lucina undatoides** is here proposed for the species described by Carpenter. Type in the California Academy of Sciences paleontology type collection, from Isthmus Cove, Espiritu Santo Island, Gulf of California.

The combination of names, *Tellina panamensis* used by Li [Bull. Geol. Soc. China, Vol. 9, No. 3, 1930 (received at the library of the California Academy of Sciences, May 2, 1931), p. 262, pl. 5, fig. 32. Dredged in 10–40 feet in Panama Bay.], had already been used by Philippi in 1848. The name **Tellina liana** is here proposed for the species described by Li. Type in the California Academy of Sciences paleontology type collection, dredged off Meanguera Island, El Salvador, in the Gulf of Fonseca, in 16 fathoms.—L. G. Hertlein and A. M. Strong.

ODOSTOMIA MONAULAX is illustrated on pl. 2, fig. 5, instead of by fig. 3, as inadvertently stated on p. 65 of the October number.

WITH THE XIV ARMY CORPS IN THE SOUTHWEST PACIFIC.—Major Merrill Moore, Medical Corps, U. S. Army, former associate in psychiatry at the Harvard Medical School and the Boston City Hospital, has been awarded the Bronze Star Medal by Major General O. W. Griswold, Commanding General of the Fourteenth Army Corps. This award, made by direction of the President, reads: "For meritorious achievement in connection with military operations against the enemy in the South West Pacific."

AN EXTENSION OF THE RANGE OF CYPRAEA RASHLEIGHANA MELVILL.—The specimen of *Cypraea rashleighana* Melvill on which this record is based was collected on Cocos Island by the 1905–1906 Expedition of the California Academy of Sciences to the Galapagos Islands. It is a beach shell. The dorsal pattern and coloring are well preserved, and the shell is but slightly eroded. The writer found the specimen while arranging the Cypraeidae collection of the California Academy of Sciences, Golden Gate Park, San Francisco, California.

To date there are two general widely separated areas from which specimens of *C. rashleighana* Melvill have been reported: one of these areas is the Hawaiian Archipelago and the other is New Caledonia and Loyalty Islands, Schilder.[1] The writer has never seen specimens from the latter area, but has collected beach shells of this species from the dredgings of Honolulu Harbor, Oahu, Hawaiian Islands, Ingram.[2] The Cocos Island record extends the range of this species several hundreds of miles eastward and southward from the Hawaiian Islands, and brings it into the fauna of the Western Americas. A close relative of this species, and one found with it in the Hawaiian Islands, is *Cypraea teres* Gmelin, reported earlier from the western Americas on Clipperton Island, Hertlein.[3]

[1] Schilder, F. A., and M. Schilder. 1939. Prodrome of a monograph on living Cypraeidae. Proc. Malac. Soc., 23: 4, pp. 119–231.

[2] Ingram, W. M. The family Cypraeidae in the Hawaiian Islands. The Nautilus, 50: 3, pp. 77–82.

[3] Hertlein, L. G. 1937. A note on some species of marine mollusks occurring in both Polynesia and the Western Americas. Proc. Amer. Phil. Soc., 78: 2, pp. 303–312.

Other cowries found typically in abundance in the more Central Pacific area have been reported from the nearby Galapagos and Clipperton Islands; these are *Cypraea gillei* Jousseaume, *Cypraea isabella* Linnaeus, and *Cypraea scurra* Chemnitz from Clipperton Island, and *Cypraea moneta* Linnaeus from the Galapagos, Hertlein (1937). Hertlein (1937) also reported *Cypraea moneta* Linnaeus from Cocos Island.—William Marcus Ingram.

Longevity in the Giant West Coast Slug, Ariolimax Columbianus (Gould).—On June 10, 1944 a single specimen of *Ariolimax columbianus* (Gould) was collected at the Mills College lodge at Gold Hollow in the general area of Nevada City, California. This animal was taken from beneath decaying pine needle trash beside a log. It was placed in a covered glass terrarium with about a pound of moist, decaying pine needles and transported to the Mills College campus, Oakland, California. Here it was left without food until it died on September 26, 1944, having gone through a starvation period of one-hundred and eight days. The terrarium temperature varied between 62 and 72 degrees Fahrenheit during the period of observation.

During the starvation period, the slug shrunk to approximately one-half of its length at time of collection. When collected its distended length was 130 mm.; at death its length was 70 mm.—William Marcus Ingram.

PUBLICATIONS RECEIVED

Johnsonia, no. 13, *The family Cardiidae in the western Atlantic*, by W. J. Clench and L. C. Smith, pp. 32, 13 text-figs. (62 photographs). Includes, as new, *Dinocardium robustum vanhyningi*. No. 14, *The genus Modulus in the western Atlantic*, by R. T. Abbott, pp. 4, 2 figs. No. 15, *The genus Columbarium in the western Atlantic*, by W. J. Clench, pp. 4, 1 fig. No. 16, *The genera Casmaria, Galeodea, Phalium and Cassis in the western Atlantic*, by W. J. Clench, 16 pp., 8 figs. Includes, as new, *Casmaria atlantica* and *Cassis madagascarensis spinella*.

These careful monographs on American species maintain the superb standards of photographic illustration set by the preceding numbers. But, one misses, in the pelecypods, adequate figures of the hinge armatures, which are so important in the diagnoses of the major groups. In the synonymic reviews, the authors must be commended especially on their acceptance of the type rule for species, in regard to which many students still apply erroneously the old method of elimination by subsequent revisers. However, they should remember that the type of a species must be a real example, not a figure, and that, for instance (no. 13, p. 23), a shell figured in Chemnitz in 1782 scarcely can be the type of a species ascribed to Linné (1758). In this general connection, one misses references to Hanley's discussions of the actual shells which Linné had before him. Nevertheless, these slight technicalities subtract almost nothing from the high admiration that these accurate descriptions and exquisite photographs must excite. JOHNSONIA is a necessity for every conchologist's library.—H. B. B.

VARIATIONS IN STROMBUS PUGILIS ALATUS, by Calvin Goodrich; Occ. Papers Mus. Zool. Univ. Mich. 490, 10 pp. This interesting statistical study of 1100 shells from Sanibel Island, Florida, points out that "the striking feature of *alatus*, in contrast to typical *pugilis*, is the absence of uniformity", and that the subspecies appears to be an ecologic rather than a geographic one. Incidentally, the chances seem slight that Bolten received the type shell from as far off the "main" as Sanibel.—H. B. B.

SOME TURRID MOLLUSKS OF MONTEREY BAY AND VICINITY, by Paul Bartsch, Proc. Biol. Soc. Washington 57 : 57–68, 1944. New species and genera are: *Antiplanes profundicola*, *A. diomedea*, *Rectiplanes* type *R. santarosana* (Dall), *Rhodopetoma* type *R. rhodope* (Dall), *Carinoturris* type *C. adrastia* (Dall) with *C. fortis* n. sp., *Megasurcula granti*, *Ophiodermella* type *O. ophiderma* (Dall) with *O. montereyensis* n. sp., *Borsonella pinosensis*, *Kurtzia* type *K. arteaga* (Dall & Bartsch) with *K. gordoni* n. sp., *Kurtzina* type *K. beata* (Dall), *Propebela diomedea*, *P. profundicola* and *P. smithi*.—H. B. B.

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SNAILS FROM THE ABORIGINAL DEPOSITS OF FRONTENAC ISLAND, NEW YORK

By C. L. BLAKESLEE

About a year ago, in conversation with Dr. William A. Ritchie, archaeologist of the Rochester Museum of Arts and Sciences staff, he mentioned that he had obtained a quantity of snail shells from an excavation made on Frontenac Island, an Indian burial site. I lost no time in asking to have a look at them. As they were encrusted with soil, he invited me to take them home where I would have time to clean and examine them.

The story of the site is this: Frontenac is a rocky island about a mile off the east coast of Cayuga Lake, and opposite Union Springs. The island is about an acre in extent, of Cobleskill limestone invested with a water-laid subsoil layer of gravelly clay, varying from 0 to 10 inches in thickness, surmounted by a nearly homogeneous refuse mantle, 10 to 29 inches deep and thickest at the lower or south end of the island. This mantle is composed of the fine ashes of burned materials plus decayed vegetation. There are two cultures. The older is approximately fifteen hundred years old and the younger a thousand.

The pits in which the shells were found were two and one half to three feet deep and averaged three feet in diameter. There were seven of them, placed irregularly over the island. The shells and artifacts occupied the lower two thirds of the pits and soil the upper third. The Doctor is assuming the snails were used for food but has no explanation nor conjecture as to why they were thrown into the pits instead of being disposed of by tossing into the lake waters. He could not say, definitely, why the deposit was made.

The following species were found, the identifications kindly confirmed for me by Dr. Pilsbry.

Helicodiscus parallelus (Say)
Hawaiia minuscula (Binney)
Retinella indentata (Say)
Zonitoides arboreus (Say)
Mesodon thyroidus (Say)
Succinea ovalis optima Pilsbry
Anguispira alternata (Say), variety.

I am in doubt about the age of the smaller species. I do not know whether the Doctor got them with the other larger ones or if they inhabit the island and lived and died in and over the top soil and became mixed with the others when exhumed. Very few of the small species were in the lot examined. The larger shells are mainly a form of *Anguispira alternata.* I have treated the inside of each specimen with diluted glue so as to strengthen the frame, as many were in an advanced stage of decay. No color remains on any of them.

The history of these shells or their relation to the occupation of the island of Frontenac by their depositors, as told by Dr. Ritchie, is interesting. The Doctor classifies the aboriginal culture of New York State under divisions which he designates as *patterns.* Thus, under the Mississippi Pattern, he places the recent races and tribes now familiar to us as inhabitants of New York State in its early days, such as the Hurons, Eries, Cayugas, Senecas, Tuscaroras and others. Under the preceding pattern he places once more ancient, or, I should say others, and in the third and oldest, designated as the archaic, he places a number of which the oldest is the Lamoka Focus (as he designates it), and this is followed immediately by the Frontenac Focus. The age of the Lamoka he places at the beginning of the Christian era, plus, and merges it into the Frontenac. These two cultures are the only ones on the island and eighty percent is Lamokian. The two mingle or intermix and survived up to about five hundred years ago.

The only species interesting for its variation from forms of usual occurrence in the region is *Anguispira alternata.* Of these 150 were sent to Dr. Pilsbry whose report follows.

"*Anguispira alternata* (Plate 6, figs. 3, 4) of the Frontenac Island pits differs from the ordinary form of western New York by its more compact coil, the spire higher and the umbilicus smaller. These peculiarities are more obvious when a quantity

is seen, as the shells vary individually, some quite high, others differing little from the ordinary form. In several measured, the height/diameter ratio is about 65 to 67. In typical *A. alternata* (Philadelphia) it is about 59; in many New York shells lower, 54 or even 50. The Frontenac shells approach the form *eriensis* Clapp, from Middle Sister and other islands in western Lake Erie, which have high shells, the height 58 to 70 percent of the diameter. This may be an ecologic form, as noted below.

"In this connection I may quote from Goodrich (Mollusca of Michigan, p. 34, 1932):

Upon the islands of Detroit River and the nearly submerged sections of southeastern Monroe County, *alternata* is much higher than in inland areas. This appears to be owing to the moist air of such places, which permits the snail to live both day and night out from under logs, where the narrow quarters tend to keep the shell growth flattened.

"I have noticed that the spire is high in specimens from islands in Casco Bay. Whether Goodrich's explanation is accepted or not, it appears that insular conditions favor the development of a high spire in *A. alternata*.

"Recent specimens from Frontenac Island are similar to the fossils, but in the average they are probably not quite so high. However, I have not verified this by a series of measurements. In a few of them the flame markings are weak or absent."

I managed to get over to Frontenac Island July 3 (1944) and was successful in collecting some Anguispira and Succinea. I did not spend as much time on the island as I should have liked to, as the man that runs the boat livery had disappeared back into the country, and no one seemed to know where he was. After waiting around over an hour a couple of colored fellows came in with a boat that they had obtained early in the day and I lost no time in seizing it after they had docked it. It was then the middle of the afternoon, but I was able to get over and put in an hour or more before a gathering storm warned me to get back to the mainland.

In the somewhat brief time I had to work I collected the 100+ sent to Dr. Pilsbry and about two dozen others that I retained. Mine were all live specimens. Nearly all specimens were collected from the foot of a length of limestone ledge hidden by

brush and vines. One had to just crawl in on hands and knees and rake over the accumulated decayed debris with the fingers for the tangle was too dense to use a hand rake. The denseness of the vegetation did not improve the light over the collecting area, nor was it helped by the approaching storm. However, with a further handicap of constantly steaming glasses, I thought the result was good. And then, just after deciding I had better run for it, I stumbled over a log about ten feet long lying on a bed of broken limestone, and storm or no storm, I turned it over and on the underside and in the rocks I got ninety percent of my live specimens. But I had to quit with this superficial effort, for there is not a particle of shelter on the island, and the distance to the mainland is a mile. Nevertheless, I made it a few feet ahead of the tempest.

STENACME FLORIDANA, AN AMERICAN MEMBER OF THE AMPHIBOLACEA

By H. A. PILSBRY

Among several recent finds which introduce genera or families new to our Florida fauna, we select *Stenacme* for description now. It is illustrated on Plate 5. This snail is related to *Amphibola* and its relatives, which are characteristic of the Australian and New Zealand faunas, a few small species extending up to the Philippines, to India, and one to South Africa. To find a related genus in Florida is certainly unexpected.

The first specimens, so far as known, were found several years ago by Thomas L. McGinty, in Lake Worth near the southern inlet. He showed the shells to me at that time, but while we recognized that it was a species not before known in Florida, we took it to be another Littorinid form—it has some resemblance to *Algamorda*—and further work on it was put off.

During the past winter an invitation from Mr. Jay A. Weber took us to Miami. The first evening Mr. Weber said he had been keeping a snail new to him to show me. He brought it out, alive and walking around in a bottle of sea water. The external form of the animal showed at once that it was no Littorinid

snail. It looked more like *Amnicola* or *Hydrobia* in shape of the foot, except that it was higher behind, seeming to clasp the lower part of the shell, as shown in Fig. 11. I made a sketch of the animal then, and others after returning to Lantana, but as it has an operculum, I still thought it a prosobranch. It was not until I examined the radula that it became clear that we had a member of the Pulmonata. It is one of the very few pulmonates, like *Amphibola,* having an operculum.

The next day Mr. Weber took our party (Tom McGinty, my daughter Elizabeth and myself) to the locality of the new snail. It is on the mainland directly opposite the inlet known as Baker's Haulover, at the upper end of Biscayne Bay. The beach is composed of small stones, which form a low little ridge about at high tide line. In the interstices of this ridge *Stenacme* lives, but it is very scarce.

When put into a dish of sea water the living animal is so active that it is hard to draw its portrait. In a few moments it gets out of the field of the binocular. Unless restrained they constantly crawl out of the water, and if left a short time they will be found on the edge of the dish, or entirely off of it. However, *Stenacme* does not seem thoroughly adapted to life in the air, as the tentacles are not held erect when it is out of water, but lie limp on the foot alongside the rostrum. This is like the fresh water snail *Pomatiopsis lapidaria,* which has somewhat similar habits.

Stenacme, new genus. Shell ovate with acuminate spire, the early whorls forming a pupiform embryonic shell, later whorls convex; axis almost or quite imperforate. Animal with normal, tapering tentacles. Radula having small narrow central teeth (or none), the side teeth narrow, all of the same shape, tricuspid, the cusps curving towards the middle line. Operculum thin, few whorled, the nucleus near the lower left margin. Type *S. floridana.*

Compared with known Amphibolidae, the shell of *Stenacme* looks most like *Salinator* Hedley, but our genus is unlike that by the differentiated apical whorls and the closure of the umbilicus. So far as known, *Salinator* does not appear to differ much from *Amphibola* in anatomy. The nearest species to ours, geographically, is *"Ampullarina" africana* E. A. Smith,

but from paratypes seen, that snail does not have the specialized embryonic shell of ours, and differs conspicuously otherwise.

I think that our genus should be segregated in a distinct family, *Stenacmidae,* characterized by having normally developed tentacles and radular teeth entirely different from Amphibolidae.[1]

Stenacme floridana, new species. Plate 5.

The shell is subperforate, ovate with acuminate spire, rather thin, of a dilute cinnamon-buff tint, paler below the suture, and with a white basal area. The surface is smooth, somewhat glossy, the lines of growth fine and indistinct. There are about 7¾ whorls, of which the first 3½ are weakly convex and whitish, forming the pupiform nuclear shell, as in Fig. 4. Following whorls are strongly convex and joined by deep almost channelled suture. The aperture is somewhat more than half the total length of the shell, ovate, narrower but not angular at the upper end. Outer margin of the lip thin; inner margin a little thickened, broadly arcuate below the umbilicus, straight above it. The umbilicus is a very narrow crevice behind the expanded inner lip (sometimes practically closed).

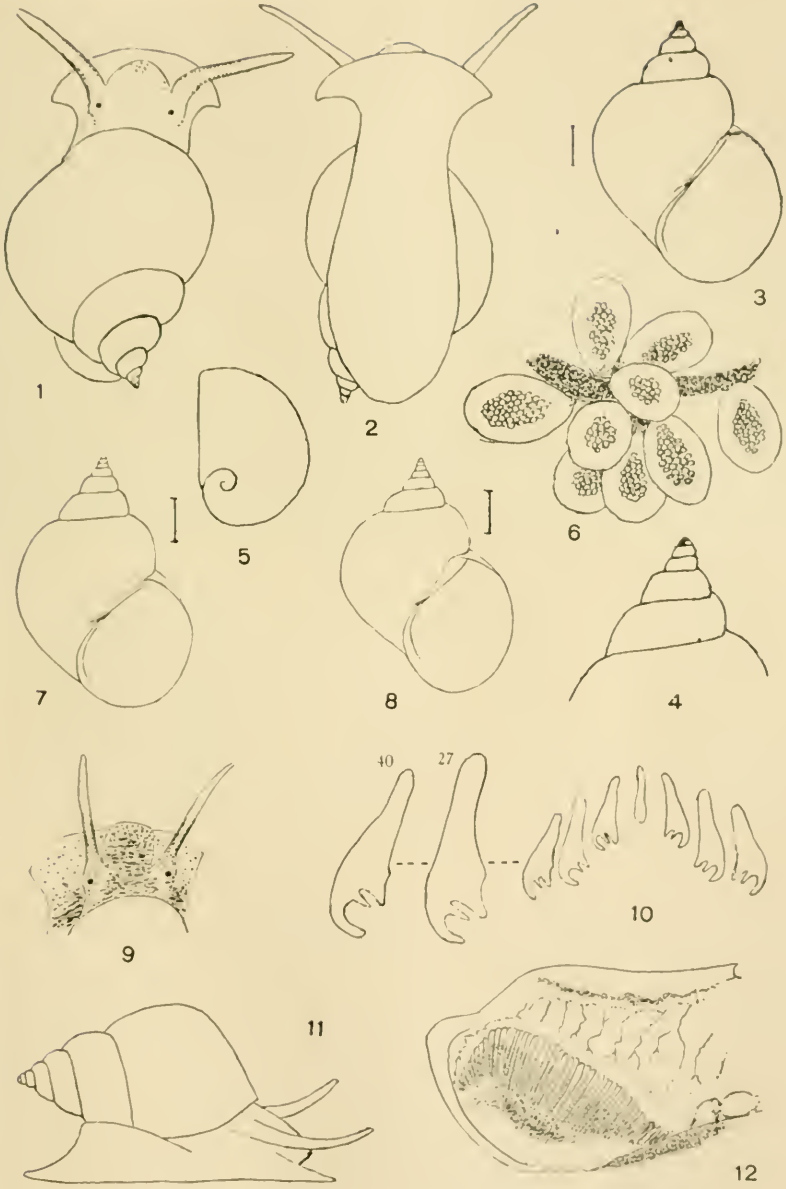
Length 6 mm., diameter 4.5 mm.

The operculum, Fig. 5, is extremely thin and flexible, rather coarsely wrinkled along lines of growth. There are about two (?) rapidly increasing whorls, but as the nucleus is rather indistinct, the exact count is uncertain.

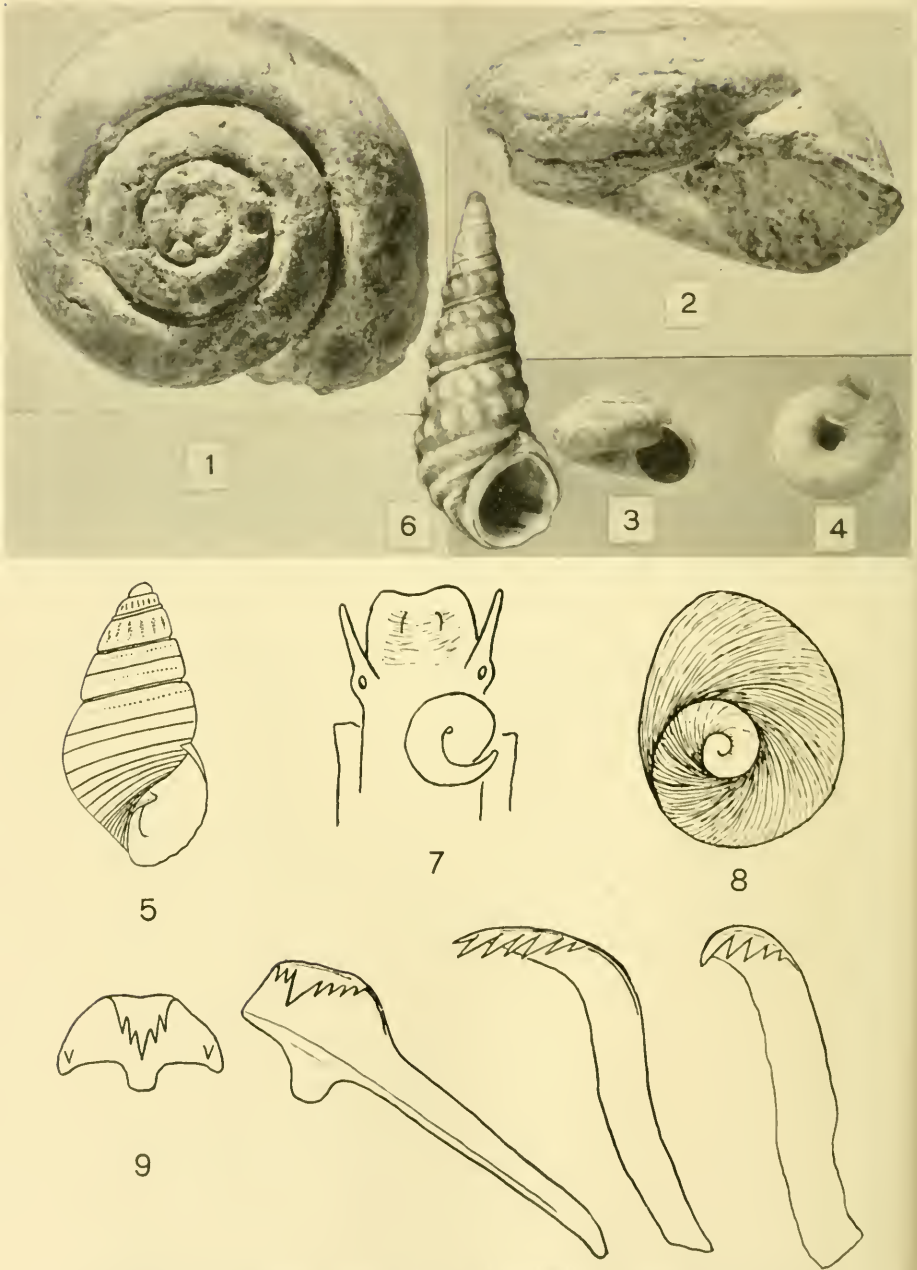
Type 180988 ANSP.

The animal has a foot shaped much like that of *Amnicola* and its allies, being more or less auriculate in front, broadly rounded posteriorly. Tentacles rather long and tapering, the eyes on slight swellings of their outer bases. In rapid motion, the front of the foot is usually in advance of the oral disc, as in Fig. 1. The color is translucent pale gray, with more or less black pigmentation on the head, and a blackish streak along each side of the tentacles, as shown in Fig. 9. The amount of pigmentation on the snout and foot varies individually. The posterior part of the foot appears to clasp the adjacent part of

[1] For teeth of *Amphibola* see Hutton, Trans. N. Z. Inst. 14: 156. Quoy & Gaimard, Zool. Voy. Astrolabe, 2: 196, gave the only figures of anatomy known to me; cf. also Lehmann, Malak. Bl. 13: 111. The teeth of *Salinator* have been well figured by Schako, Jahrb. d. malak. Ges. 5: 1, 1878.



Stenacme floridana. Figs. 1–5, 10, type, Biscayne Bay. Figs. 6–9, 11, 12, Lake Worth.



Figs. 1, 2, *Rodopoeus crassus*. 3, 4, *Anguispira alternata*, Fronteuac Island. 5, *Odostomia hilocusis*, page 65. 6–9, *Parapeosostheuia gredleri*.

the shell, as in Fig. 11. This is owing to the large size of the operculigerous lobe, which presses the large, flexible operculum up against the shell.

The radula is short and broad, with teeth (Fig. 10) arranged en chevron. There is a small, narrow central tooth, but on the older part of the radula I do not see it. Side teeth are all very similar in form, long and narrow, with three cusps turned toward the rachis, the middle cusp small, the outer one long and strongly curved. The inner teeth are very small, but they increase in size outwardly; over most of the radula they are at least double the size of those near the center. I did not see the outermost teeth.

As seen from the outside through the transparent mantle over the lung cavity (the shell being removed), some branching transverse venation appears in the upper part; below that the large organ which in Amphibola has been called the kidney by Simroth, practically following Quoy ("organe dépurateur"), which is about in the position of the kidney of *Lymnaea*. However, when the mantle is opened, this organ does not have the structure of a kidney, but rather that of an adaptive or secondarily developed gill, such as has been described for *Siphonaria*. It is composed of many narrow triangular leaflets projecting free in the lung cavity, attached to the inner surface of mantle by their long bases. The sketch, Fig. 12, is diagrammatic, as the object is strongly convex. Mantle edge at the left, hind-gut along the upper margin. A further study is to be made of the anatomy when a few more well preserved specimens are available.

The very numerous oval white eggs are contained in clear, gelatinous, oval capsules, about 1.3 mm. long, connected by a very short and slender stalk to a gelatinous axis, which in those seen is dark colored from the included particles of mud. (Fig. 6.) They were found by Mr. McGinty.

The Lake Worth specimens seen (Figs. 7, 8), collected by McGinty, are slightly smaller than the type from Biscayne Bay, and show some variation in size of the aperture as the figures show. The color is usually dark carob brown except for a small pale area at the columella; or on the last whorl lighter, dull ochraceous-tawny, with a white columellar area. The two

figured are 5.4 and 4.9 mm. long. The animal is more heavily pigmented in some specimens, as in Fig. 9, and the irregular opaque white patches next to the eyes are therefore more conspicuous. In those I observed alive the front corners of the foot were never so strongly auriculate as in the type specimen from Biscayne Bay.

Explanation of Plate 5

Figs. 1–5, 10 are from the type specimen, Biscayne Bay. Figs. 6–9, 11, 12 are from Lake Worth, near the south inlet. 1, 2, outlines of living animal; 3, shell of type; 4, early whorls of same, more enlarged; 5, operculum; 6, group of egg capsules; 7, 8, extremes of shape of shell; 9, head; 10, group from middle of radula, with 27th and 40th lateral teeth; 11, living animal; 12, pallial organs as seen through the mantle. Scale lines for figs. 3, 7, 8 = 1 mm.

HODOPOEUS, A FOSSIL ESTRAY

By H. A. PILSBRY and T. D. A. COCKERELL

We have received a large helicoid fossil which was found by Miss Bess Peacock in a collection of miscellaneous objects given to the Mt. Vernon Junior High School at Los Angeles. Where it was found could not be ascertained, but very probably it came from New Mexico or Texas and presumably is of Eocene or Paleocene age. The specimen, now No. 16660 ANSP., is a cast in rather hard limestone.

Is it ever advisable to publish a species of unknown provenance? Usually our decision would be adverse; but circumstances may make publication expedient. The species under consideration apparently belongs to the family Camaenidae, a group most copiously developed in the eastern hemisphere, from Japan and China to Australia, but also comprising most of the large helices of tropical America. That they reached the West Indies and South America *via* western North America may be assumed. We would expect to find such large, solid shells preserved as fossils; smaller members of the same general group, such as *Oreohelix*, with a simple lip, have been found from Upper Cretaceous on. This new fossil supplies one of the large

typical Camaenidae, with expanded peristome, which may credibly be in the ancestral line of the American tropical forms, and serve to demonstrate the route of their migration. After Paleocene or Eocene times the large Camaenidae seem to have disappeared from western North America; or at least, later ones have not turned up.

The new genus *Hodopoeus*[1] may be defined provisionally as having a large, regularly coiled, heliciform shell, with umbilicate base, strongly oblique aperture, the peristome with expanded outer and basal margins. In general shape it resembles *Camaena* (*Pseudobba*) *quoyi* (Desh.), of Celebes.

Hodopoeus crassus, new species. Plate 6, figs. 1, 2.

The large, helicoid cast indicates a depressed shell with moderately convex spire, rounded periphery and rather large umbilicus. External sculpture unknown. The cast shows about 4 whorls (and the shell may have had about 5, the apical whorls being injured). The summit is somewhat flattened. The last whorl descends rather suddenly and strongly in front. Suture apparently deep. The aperture is strongly oblique, rounded, the upper and basal margins converging, the parietal margin short. The outer and basal margins of the lips appear to have been expanded (or possibly reflected?), the upper margin but little if at all expanded. The rather ample umbilicus appears a little expanded behind the columellar lip.

Height 37 mm., greater diameter 59 mm. lesser 51 mm.

The cast clearly shows that the outer lip was somewhat expanded, thus differing from *Orcohelix*. The lip is not known in the large *O. megarche* Ckll. & Hend. (Bull. Amer. Mus. N. H. 31: 230), but the keeled early whorls and shallow suture of that shell probably indicate generic difference from our fossil. Compared with large Recent helices, the shell is not much like the large *Lysinoe ghiesbreghti*. It has rather differently shaped whorls of smaller caliber, and a smaller aperture, its plane more inclined, being bent, as seen in a profile view, much as in *Caracolus caracolla* (L.) or *Isomeria oreas* (Koch). The deflection of the last whorl in front, the size of the aperture and the umbilicus, so far as visible, are much as in *Isomeria oreas*, which however, by its transversely dilated outline and superficial suture, is unlike our fossil.

[1] Ὁδοποιος, a pioneer.

CARDITA (*CYCLOCARDIA*) *LONGINI*, NEW NAME FOR *VENERICARDIA* (*CYCLOCARDIA*) *NODULOSA* DALL, 1919

By JOSHUA L. BAILY, Jr.

In his Catalogue of Shells collected at Panama,[1] C. B. Adams lists the name *Cardita modulosa* (?) Valenciennes[2] under the synonymy of *Cardita affinis* Sowerby.[3] He then offers the following comment:

"Valenciennes quotes Lamarck for the name which he gives to this species, which must therefore be an error for *nodulosa*. But the Lamarckian shell probably belongs to a different species, for it is said to be Australian. The name *nodulosa* is yet farther involved in errors by its reappearance in Reeve's Iconica[4] for a very different species."

Reference to Reeve's work indicates that his species is probably Sicilian,[5] and quite distinct from that of Lamarck. The name *nodulosa* for at least one species of this genus may be therefore considered established.

In 1919 Dall[6] described *Venericardia (Cyclocardia) nodulosa*, and in 1921[7] published as its habitat Santa Barbara to the Coronado Islands. As long as this species was retained in the genus *Venericardia*, Dall's name was valid, but in 1931 Grant and Gale[8] transferred the section *Cyclocardia* to *Cardita*, the result of the discovery of an earlier type designation for the last named genus. A year earlier Stewart[9] had indicated that the affinities of *Cyclocardia* were with *Cardita* rather than with *Venericardia*.

When the present writer called the attention of Mr. John Q. Burch[10] to the need of a new name for this species, the latter

[1] Ann. Lyc. Nat. Hist., v. 5, p. 264, no. 427, 1852.
[2] Voy. Venus, Moll., pl. 22, f. 2, 1846 (fide Adams).
[3] Proc. Zoöl. Soc. Lond., p. 195, 1832 (fide Adams).
[4] Conch. Icon., v. 1, *Cardita*, pl. 9. f. 44, 1843.
[5] Proc. Zoöl. Soc. Lond., 1843 (fide Reeve, Conch. Icon.)
[6] Proc. Biol. Soc. Wash., v. 32, p. 249, 1919.
[7] Bull. U.S.N.M. 112, p. 32, 1921.
[8] Mem. San Diego Soc. Nat. Hist., v. 1, p. 272, 1931.
[9] Spec. Publ. No. 3, Acad. Nat. Sci. Phil., p. 150, 1930.
[10] Proc. Conch. Club Sou. Calif., p. 13, Sept. 1944.

tendered him the honor of suggesting the name *Cardita bailyi*, but the present writer doubts whether Mr. Burch's name was legally proposed. In the first place, the proposal was not accompanied by either a description or a bibliographic reference, as required by the International Commission;[11] secondly, the publication in which it was offered is not open to public subscription; and thirdly Mr. Burch himself stated that his name was intended to be used only pending the publication of a permanent name.

Since the present writer has no desire to see his own name perpetuated in that of a species with whose discovery or recognition he had nothing to do, and since he has long felt the need of naming a species after the first writer to discuss the mollusk fauna within the bounds of the state of California as at present constituted, he suggests for this species the name of *Cardita* (*Cyclocardia*) *longini* nom. nov. He does not feel it to be necessary to rewrite Dall's description, or to designate a new type specimen, but wishes only to do belated justice to a pioneer who has been undeservedly neglected, by supplying his name in place of an older one that is no longer tenable.

Concerning José Longinos Martínez, in whose memory the new name has been proposed, little is known. He came to Mexico in 1791 with Sesse y Lacosta and Mocino, and in the same year established a museum of natural history in that city in which the exhibits were arranged according to the Linnean system. The following year, accompanied by a military escort but no other scientific personnel, he made the overland journey from La Paz to San Francisco, sending a shipment of specimens to the archbishop of Seville from the Mission of San Borjas, and officiating as godfather at the baptism of an Indian boy at San Diego, where his name was recently discovered on the baptismal record of the San Diego mission by Mrs. Winifred Davidson, the San Diego historian. Not until 1898 was an English translation of a fragmentary transcription of his report published.[12] The original is not known to exist. The mala-

[11] Opinion, 138.

[12] California in 1792. The Expedition of José Longinos Martínez, by L. B. Simpson. Henry E. Huntington Library, 1938.

cological references in this document are confined to nacres, patelas, and pinas, which obviously are the genera which we call Haliotis, Acmaea, and Mytilus.

In view of the practice of Mexican citizens of using the patronymics of both parents, with the mother's last, the name Longinos rather than Martínez has been chosen for this species, whose geographic range is included within the limits of the area which Longinos explored.

GASTROPOD SHELLS INHABITED BY HAWAIIAN HERMIT CRABS

By DONALD C. G. MacKAY

In the course of a study of the behavior of the hermit crabs *Calcinus herbstii* de Man and *Clibinarius zebra* Dana at the Marine Laboratory of the University of Hawaii at Waikiki Beach during the year 1941–42, the writer had occasion to note the species of mollusks inhabited by hermit crabs of the species mentioned. For assistance in the identification of the mollusks he is greatly indebted to Mr. Jens M. Ostergaard and to Dr. Charles Howard Edmondson, both then of the Department of Zoölogy of the University of Hawaii.

The literature contains references to the shells typically inhabited by various species of hermit crabs in Hawaii. For example, Edmondson (1933) states that *Aniculus strigatus* Herbst is usually found occupying the shells of a species of *Conus*, a situation that is made possible by a dorso-ventral constriction of the body of the hermit crab. In the case of *Dardanus punctulus* (Olivier), the largest hermit crab in Hawaii, he states that large specimens of the species are often taken at a depth of a few fathoms and are usually found occupying the shells of a large triton, *Charonia tritonis* (Linnaeus). *Dardanus asper* (de Haan) and *D. deformis* (Milne Edwards) characteristically occupy shells of *Turbo intercostalis* Menke, or else those of a species of *Tonna*. Another and un-

identified species is found in mollusks of the genus *Vanikoro* on Kahala Reef, Oahu, according to the same authority.

In the writer's experiments hermit crabs deprived of their usual dextrally coiled shells were found to accept oppositely-coiled shells of Hawaiian arboreal snails of the family Achatinellidae. They also accepted any object of suitable size which contained a hole of approximately the correct size; even a section of glass tubing was used in the laboratory on a number of occasions. When shells were attached to pieces of wood so that they floated just high enough above the substratum to permit the hermit crabs (*C. herbstii*) to get their feet on the substratum, the hermit crabs likewise accepted them.

Hermit crabs were found in nature not only in gastropod shells but also in pieces of coral, in calcareous worm tubes, and one was even found in the unattached claw of a crab. Objects provided in the laboratory which did not contain holes (e.g., marbles) were examined closely for openings by the crabs. Hermit crabs kept in a large shallow metal tray were apparently always ready to "trade in" old shells for others and a frequent sound in the laboratory was that made by one hermit crab jerking another noisily from its shell. As frequently as not the newly acquired shell proved no better than the old one, and was promptly discarded in favor of the latter.

The writer has elsewhere [1] presented the results of examining several large aggregations of hermit crabs in which the gastropod shells occurring most frequently were listed.

The observations that follow are based on the identification of shells of hermit crabs chosen at random from two species for the purpose of behavior experiments not here recorded.[2] Table I presents the number of individuals (out of 104 in the case of *Calcinus herbstii* and 105 in the case of *Clibinarius zebra*) inhabiting shells of each of the common species. For each species of hermit crab some shells were unidentifiable, usually because hermit crabs often occupy worn or encrusted shells which may be difficult or impossible to place.

[1] This paper will appear in an early issue of Ecology.

[2] The preliminary paper is in press and will appear in the *Journal of Comparative Psychology*.

TABLE I

Shells inhabited by the hermit crabs *Calcinus herbstii* de Man and *Clibinarius zebra* Dana. The genera are listed alphabetically.

Shell species	*Calcinus herbstii*	*Clibinarius zebra*
Cerithium nesioticum Pilsbry & Vanatta	0	3
Columbella zebra Gray	0	12
Cymatium tuberosum (Lamarck)	8	0
Hydatina amplustre (Linnaeus)	3	0
Littorina pintado Wood	2	3
Maculotriton bracteatus (Hinds)	0	2
Melampus castaneus (Mühlfeld)	0	1
Melania mauiensis Lea	0	2
Morula fiscella (Chemnitz)	7	4
Morula ochrostoma (Reeve)	3	1
Morula porphyrostoma (Reeve)	1	0
Morula tuberculata (Blainville)	7	2
Natica marochiensis Gmelin	1	0
Nerita neglecta Pease	0	13
Nerita picea Recluz	29	15
Nerita polita Linnaeus	1	0
Peristernia chlorostoma Sowerby	13	38
Pisania tritonoides Reeve	1	0
Thais harpa (Conrad)	0	1
Turbo intercostalis Menke	20	1
Family Vermetidae	3	1
Unidentified	5	6
Totals	104	105

It will be noted that *Nerita picea* and *Peristernia chlorostoma* were used in considerable numbers by both species of hermit crabs. On the other hand certain species of mollusks whose shells were used extensively by one species of hermit crab were rarely, if ever, used by the other species. Examples are: *Turbo intercostalis,* commonly used by *Calcinus herbstii* but not by *Clibinarius zebra,* and *Columbella zebra* and *Nerita neglecta* often found in use by *Clibinarius zebra* but not by *Calcinus herbstii.*

Doubtless there are many reasons why hermit crabs of a given species may be found in the shells of one species of mollusk rather than in those of another. Undoubtedly important fac-

tors in this connection are (1) relative availability of various species of mollusks, (2) sizes of different species both of mollusks and of hermit crabs, (3) the shapes of both mollusks and hermit crabs, (4) the sizes attained by both mollusks and hermit crabs, (5) the direction of coil in each case. Since the shells of small species of mollusks may be relatively quite abundant, it is not uncommon to find small hermit crabs in the shells of such species while larger individuals of the same species of hermit crab will inhabit the shells of other species of mollusks. When *Calcinus herbstii* is taken as an example and the measured individuals are divided into two groups on the basis of size, the results shown in Table II are obtained.

TABLE II

Shells inhabited by *Calcinus herbstii*. Where a species of mollusk is represented by fewer than 3 cases it has been omitted. The size given is the maximum length of the cephalothorax of the hermit crab.

Species of Mollusc	Hermit crabs up to and including 0.60 cm.	Hermit crabs longer than 0.60 cm.
Nerita picea	15	16
Peristernia chlorostoma	13	—
Morula fiscella	7	—
Morula tuberculata	7	—
Cymatium tuberosum	1	7
Hydatina amplustre	1	2
Turbo intercostalis	—	19
Family Vermetidae	—	3
Totals	44	47

From Table II it will be seen that whereas *Peristernia chlorostoma*, *Morula fiscella*, and *Morula tuberculata* were used by the small hermit crabs in 27 out of 44 cases they were not used by any of the larger crabs in the same sample. Conversely, *Turbo intercostalis* and *Cymatium tuberosum* were used 26 times out of 47 by the larger hermit crabs and only once by the smaller ones.

In collecting *Calcinus herbstii* the first impression of the writer was that they are typically found in shells of *Turbo*

intercostalis, an observation that is more or less correct when only the larger individuals are considered. However, when the smaller hermit crabs of the same species shown in the table were also examined it was found that *Turbo intercostalis* did not occur once in the 44 cases.

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ECOLOGICAL NOTES ON THE GASTROPODA OF THE GREAT SWAMP (NEW JERSEY) [1]

By WILLIAM F. RAPP, Jr., and JANET L. C. RAPP

In the spring of 1944 the writers began an ecological survey of the Great Swamp of New Jersey. The survey covers a half-mile square area located in Chatham Township, Morris County. The area is easily found since the northern boundary lies on what is locally known as Southern Boulevard starting at the point where the Public Service power line crosses the boulevard and continuing one-half mile west. The eastern boundary begins at the same point and runs south along the power line for one-half mile.

The Great Swamp is the remains of Lake Passaic which, during the Wisconsin glacial period, occupied a large area of what is now New Jersey. The northern boundary of the Swamp is the southern face of the Wisconsin terminal moraine. However, the name "swamp" is a misnomer since it is not used in the strict ecological sense. Actually in the survey area all types of ecological conditions exist from purely terrestrial to purely aquatic.

There is a thick humus layer in the swamp underlined with glacial sands. The soil has a pH of four to five and supports a flora of trees and shrubs which can tolerate such conditions.

As would be expected the Gastropod fauna is very limited due to the highly acid nature of the soil. However, it is not

[1] Second contribution to an Ecological Survey of the Great Swamp.

entirely lacking. According to the modern theory of soil reaction, the pH is dependent upon the proportion of acid ions to the alkaline ions present. Therefore, even though the soil is highly acid, some calcium must be present from which the higher plants derive enough for their needs. The snails obtain the calcium for the building of their shells from these plants.

Only one land snail seems to be present in the Swamp, *Zonitoides arboreus* (Say). This small snail is fairly common and has been found in a variety of habitats. We have taken it under the dry loose bark of fallen trees, under damp rotting logs, and on decaying stumps.

Philomycus carolinianus flexuolaris (Raf.) is the only slug that we have found. It appears to be the most common Gastropod in the Great Swamp. Since it lacks a shell and consequently does not need lime to the extent that a snail does, it is able to prosper in this area.

We have taken one specimen of *Planorbula jenksi* (Carpenter) which is a fresh water snail. This we found on damp ground. According to Dr. A. H. Pilsbry (in a personal communication) this species is often found on damp soil far from free water but submerged a large part of the year.

We extend sincere thanks to Dr. Henry A. Pilsbry of the Academy of Natural Sciences of Philadelphia for determining our material and for the help he has given on various questions.

SOME SNAIL RECORDS FROM NORTHEASTERN KENTUCKY

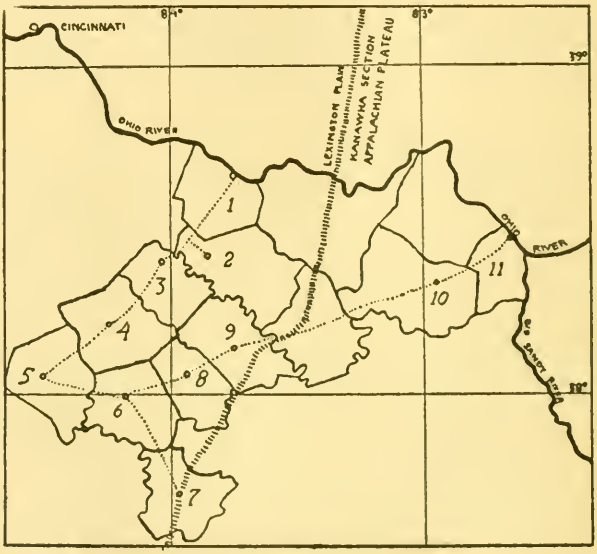
By CHARLES B. WURTZ

During the late summer of 1941 I had occasion to take a collecting trip through northwestern West Virginia, southeastern Ohio, and northeastern Kentucky. At the suggestion of Dr. Pilsbry I am recording here the results of the nine days I spent in northeastern Kentucky.

That part of the state in which I collected shows two physiographic regions. To the west is the Lexington Plain, and to the east lies the Kanawha Section of the Appalachian Plateau

(see map). The entire region represented by my stations is below 1,000 feet in elevation.

The summer had been quite dry, and this resulted in sparse collecting. This was the first time I had ever seen snail eggs desiccated, apparently, by the climatic conditions.



Map of Northeastern Kentucky, the author's route indicated by dotted line. Counties, 1, Mason showing location of Maysville. 2, Fleming showing location of Ewing. 3, Nicholas showing location of Blue Licks. 4, Bourbon showing location of Paris. 5. Fayette showing location of Lexington. 6, Clark showing location of Winchester. 7, Estill showing location of Irvine. 8, Montgomery showing location of Mt. Sterling. 9, Bath showing location of Owingsville. 10. Carter showing location of Grayson. 11. Boyd showing location of Ashland.

I entered Kentucky at Maysville in Mason County, and left it at Ashland in Boyd County. The map indicates the route followed. The localities where I collected, and the species collected, are as follows:

1. Mason County; the crest of the hill south of Maysville along Route 68; August 31, 1941; 5 species: *Stenotrema fraternum* (Say), *Mesodon thyroidus* (Say), *M. inflectus* (Say), *Ventridens ligerus* (Say), and *Anguispira alternata* (Say).

2. Fleming County; the hillside opposite the railroad station at Ewing; September 1, 1941; 3 species: *Triodopsis tridentata* (Say), *Ventridens ligerus* (Say), and *Haplotrema concavum* (Say).

3. Nicholas County; southern bank of the Licking River at Blue Licks; September 1, 1941; 10 species: *Stenotrema fraternum* (Say), *Triodopsis rugosa anteridon* Pilsbry, *Mesodon thyroidus* (Say), *M. zaletus* (Binney), *M. inflectus* (Say), *Mesomphix inornatus* (Say), *M. perlcavis vulgatus* (H.B.B.) (*laevigatus* Pfr.), *Omphalina cuprea* (Raf.), *Anguispira alternata carinata* (Pilsbry), and *Haplotrema concavum* (Say).

According to Dr. Pilsbry the type locality of *Mesomphix perlcavis vulgatus* (H.B.B.) is Lexington in Fayette County, Ky., but since it was first described it has not been taken any closer to Lexington than Cincinnati, Ohio. The specimen I collected at Blue Licks decreases this distance fully 40 miles. (Cincinnati is about 85 miles from Lexington.)

4. Bourbon County; along the railroad bed at the southern edge of Paris; September 2, 1941; 4 species: *Mesodon appressus* (Say), *M. inflectus* (Say), *Ventridens ligerus* (Say), and *Anguispira alternata* (Say).

5. Fayette County; 8 miles east of Lexington along Route 60 (at Boot's Inn); September 2, 1941; 2 species: *Mesodon thyroidus* (Say) and *Anguispira alternata* (Say).

6. Clark County; 8 miles north of Winchester on Tobley's farm; September 2, 1941: *Mesodon inflectus* (Say).

7. Estill County; Pilot (about 20 miles north of Irvine); September 3–5, 1941; 16 species: *Stenotrema hirsutum* (Say), *S. stenotrema* (Pfr.), *S. edvardsi* (Bld.), *S. fraternum* (Say), *Triodopsis tridentata* (Say), *T. albolabris* (Say), *Mesodon thyroidus* (Say), *M. sayanus* (Pilsbry), *M. appressus* (Say), *M. inflectus* (Say), *Ventridens ligerus* (Say), *Gastrodonta interna* (Tryon), *Retinella* sp., *Zonitoides arboreus* (Say), *Anguispira alternata mordax* (Shutt.), and *Haplotrema concavum* (Say).

8. Montgomery County; 2 miles west of Mt. Sterling along Route 60; September 6 and 7, 1941; 8 species: *Stenotrema fraternum* (Say), *Mesodon inflectus* (Say), *M. thyroidus* (Say), *Anguispira alternata carinata* (Pilsbry), *Succinea* sp., *Pupoides*

marginatus (Say), *Gastrocopta contracta* (Say), and *G. armifera* (Say).

9. Bath County; 1 mile east of Owingsville along Route 60; September 7, 1941; 9 species: *Mesodon inflectus* (Say), *M. pennsylvanicus* (Green), *M. thyroidus* (Say), *Ventridens ligerus* (Say), *Anguispira alternata carinata* (Pilsbry), *Pupoides marginatus* (Say), *Gastrocopta armifera* (Say), *G. contracta* (Say), *and G. corticaria* (Say).

Although W. G. Binney (1885) gives Kentucky as within range of *Mesodon pennsylvanicus* (Green), Pilsbry (1940) fails to include that state in his monograph. The specimen collected in Bath County on this trip demonstrates the presence of this species well within the borders of the state.

10. Carter County; at Cascade Caves near Grayson; September 7, 1941; 14 species: *Stenotrema hirsutum* (Say), *S. fraternum* (Say), *S. Stenotrema* (Pfr.), *Triodopsis tridentata* (Say), *S. notata* (Desh.), *T. albolabris* (Say), *Mesodon appressus* (Say), *Omphalina cuprea* (Raf.), *Ventridens ligerus* (Say), *Retinella* sp., *Anguispira alternata carinata* (Pilsbry), *Discus patulus* (Desh.), *Haplotrema concavum* (Say), and *Gastrocopta armifera* (Say).

In the series of four shells of *Triodopsis albolabris* (Say) taken here the greatest diameter of three (measurements are exclusive of the reflected lip) was 27.5, 28.5, and 28.5 mm. The fourth, however, had a diameter of 35 mm. The height of these shells was, respectively, 18.5, 19, 19, and 20.5 mm.

I also found *Haplotrema concavum* (Say) feeding here on young *Ventridens ligerus* (Say). It had completely consumed or dissolved about half of the shell of the *Ventridens*. This was the third such incident I observed on this trip. The first occurred at Boaz, Wood County, W. Va., where it had destroyed half the shell of *Discus patulus* (Desh.). The other occurrence was at Hooper's Park, Vinton County, Ohio. In this case the animal was feeding on *Stenotrema hirsutum* (Say), and a like amount of shell had been destroyed. Apparently this species does not necessarily feed only on those forms that possess a shell large enough to permit its entry into the aperture.

11. Boyd County; Rockdale (5 miles west of Ashland along Route 60); September 8, 1941: *Triodopsis albolabris* (Say).

CYPRAEIDAE FROM THE ADMIRALTY ISLANDS WITH THERAPY NOTES ON THEIR USES

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This report includes a list of Cypraeidae from the Admiralty Islands in the Bismarck Archipelago together with habitat notes based on the first hand observation of a trained field observer. The majority of the listed species were collected in the living state. The collecting area was off Pitiyliu (Pityili) Island. Staghorn coral grows out from the shore adjacent to a lagoon which is bordered by an outer reef. This reef is largely exposed at a low tide, thus providing an ideal offshore collecting area. Of the twenty-six species reported here only four are abundant; these species are *Cypraea moneta* Linnaeus, *Cypraea annulus* L. *Cypraea arabica* L., and *Cypraea caputserpentis* L. The great size variation inherent in the cowries from a single locality is well shown in certain species listed here; measurements illustrating such variation are included. The measurements are based only on mature individuals.

Appended is a discussion of the uses to which the shells are put by the armed force personnel in the area, for the mollusca more than any other group of animals is providing a self-occupational therapy for men based in the relatively remote areas of the Pacific, and the writers feel that such information is generally valuable to the conchologists that remain at home. One future danger concerning the acceptance, without question, of distributional records of this striking group of mollusks is obvious. Armed force personnel returning to the Hawaiian Islands and the "States" are carrying shells back with them, having collected perhaps at a number of localities without separating collections, and trusting to memory the collection locality of each specimen; thus, unintentionally, unreliable locality records will no doubt creep into the literature of molluscan distribution. The first author observed this happening

[1] Lt. (jg); U.S.N.R.

in the Hawaiian Islands as early as 1937 when Cypraeidae were brought back from certain islands by the Pan American colonizers and were being sold in Hawaii as local shells, Ingram (1944). Several other instances of shells being sold by people returned from the Pacific have been observed in San Francisco, Calfornia, when locality records had obviously been forgotten. This mixing of locality records is reminiscent of what happened in Hawaii many years ago when shells from the missionary ship Morning Star worked their way into dealers' and collectors' hands as being from Hawaii, when in reality they came from localities many hundreds of miles away from the Hawaiian Islands; certain of these inaccurate records of Hawaiian Cypraeidae are included in Bryan (1915) and Schilder and Schilder (1939), Ingram (1944). Spicer (1941) in his valuable article concerning the mixing of Guam and Midway locality records states, "The Guam boys employed at the Pan-Air Hotel [on Midway] have taken advantage of this shell enthusiasm by importing large numbers of colorful Guam shells and selling them to the construction employees [on Midway]. These Guam shells are being mixed indiscriminately with the Midway shells, and some may eventually gravitate to museums and collectors bearing a Midway label."

Listed Species

Cypraea annulus L. This is the second most common species; its habitat is with that of *Cypraea moneta* on the sea side of the outer reef where it was taken from beneath coral rock, in holes and cracks in the reef, and on the exposed heads of corals and coral rock; in addition it was commonly found in the quiet water of the lagoon.

Cypraea arabica L. This species is the third most common; it was typically found on the outer reef on the seaward side under broken coral heads. The largest individual was 44 mm. long and the smallest 32 mm.

Cypraea argus L. A beach shell with no specific reef locality.

Cypraea asellus L. One well preserved dead specimen was found in the lagoon.

Cypraea caputserpentis L. This species was typically found on the seaward side of the outer reef; it was taken from crevices

in coral heads, holes in coral rock, and among branches of coral heads.

Cypraea carneola L. Specimens were taken in sheltered pockets on the seaward side of the outer reef. The specimens are remarkably small, and are perfect miniatures of the largest cylindrical specimens that we have seen; the largest is 30 mm. long by 18 mm. broad, and the smallest is 21 mm. long by 12 mm. broad.

Cypraca caurica L. Individuals were taken from beneath coral rocks on the outer edge of the outer reef.

Cypraca cribraria L. One specimen was taken from the outer reef beneath broken coral rock. The mantle of this species is alizaran-crimson with pustules of the same color.

Cypraca cruenta Gmelin. One well preserved specimen was found occupied by a hermit crab; no specific reef locality.

Cypraca errones L. Individuals were often found in pairs; they were typically taken from beneath coral rock and in holes on the seaward side of the outer reef.

Cypraca erosa L. These were commonly found in pairs on the lagoon side of the outer reef on top of, and beneath coral rocks. The largest individual measures 35 mm. in length and the smallest 21 mm.

Cypraca fimbriata Gmel. Individuals were taken from beneath rocks on the outer reef. Specimens are identical to those from the Hawaiian Islands, Ingram 1937a; from Christmas, Washington, Fanning, and Palmyra Islands, Ingram 1937b; from Samoa, Ingram 1939; and from Puka Puka Island, Ingram 1944.

Cypraea isabella L. Specimens were taken from beneath coral rock and in small holes on the outer edge of the outer reef. Individuals vary in length from 27 mm. to 18 mm.

Cypraea helvola L. Individuals were found in a sheltered pocket on the seaward side of the outer reef beneath coral rock and on top of coral rock. The largest individual is 24 mm. long and the smallest 16 mm.

Cypraea labrolineata Gaskoin. Dead, well preserved, individuals were found in the lagoon.

Cypraea cruenta Gmelin. One well preserved specimen was found occupied by a hermit crab. No specific reef locality.

Cypraea lynx L. Individuals were typically found in abundance in the lagoon in areas not exposed at low tide; here they were associated with a good algae growth on the exposed floor of the lagoon. They were also taken from beneath coral rock in the lagoon. The largest individual is 42 mm. in length and the smallest 28 mm. The cloudy-blue color of the dorsum outranks the brown colored dorsum four to one.

Cypraea mauritania L. No specific locality.

Cypraea moneta L. This species was the most common of the Cypraeidae; more than 1,000 were collected. It was a typical inhabitant of the sea side of the outer reef where it was collected under coral rock in holes and cracks in the reef, and on the exposed surface of coral heads and rocks.

Cypraea neglecta Sowerby. No specific locality.

Cypraea quadrimaculata Gray. One specimen was collected in the locality typical for *C. errones.*

Cypraea scurra Gmel. No specific locality. The largest individual is 46 mm. long and the smallest 36 mm.

Cypraea talpa L. A single specimen was taken from beneath a coral rock on the lagoon side of the outer reef in relatively quiet water.

Cypraea tigris L. Specimens were taken from staghorn coral and from beneath broken coral close to the island in quiet water.

Cypraea vitellus L. Specimens were typically found in the lagoon beneath coral rock and in holes in the lagoon bottom. They did not expose themselves at low tide. They varied in length from 43 mm. to 32 mm.

Nuclearia nucleus (L.). No specific locality. The largest individual is 23 mm. in length and the smallest 14 mm.

Therapy of the Cypraeidae.—It is estimated that approximately eighty-five per cent of the armed force personnel in this area collected mollusks at one time or another. Based on conversations and in watching the actions of collectors, men in battle zones and on isolated islands receive immeasurable benefit in being carried away from the pressure of war and isolation while they are vying with one another collecting mollusks.

Enthusiastic collecting by members of the armed forces in the above area of the Admiralty Islands will no doubt have an

effect upon the future abundance of the attractive Cypraeidae, for it was observed that readily accessible areas were being swept clean of these shells, and that the breaking up of coral heads through the use of crowbars is revealing even the most secretive species to the mass collectors. Very few collectors in this area bother with eroded beach shells, but pursue vigorously their interest in obtaining fresh specimens. While all fresh cowry species are collected, two, *Cypraea annulus* Linnaeus and *Cypraea moneta* Linnaeus, are the most commonly used for jewelry. These two species, respectively called locally "Tiger eyes" and "Snake eyes," are made into pendants, necklaces, bracelets, earrings, pins, and studs for belts. The shells that are made into bracelets, pendants, and necklaces are mounted on dog tag chains or cords. The local price for these varies from twelve to fifteen dollars. The base for pendants, earrings, and pins is made from silver coins and bits of stainless steel. Turtles were commonly made by using pipe cleaners and *Cypraea caputserpentis* L.

Dr. Merrill Moore, now serving in the Medical Corps of the United States Army and Director of Research, The Washingtonian Hospital, 41 Waltham Street, Boston, Massachusetts, has shown a special interest in conchology as a form of occupational therapy (1942a) (1942b); a good bibliography of shells as they relate to psychiatry is cited in this latter reference. This datum is cited here as the importance of occupational therapy looms large on the horizon of rehabilitation as it may apply to certain hospitalized service men, for it is the belief of the writers that those working in pure conchology should have their attention called to the importance of mollusks as they relate to certain phases of curative and preventative medicine.

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PARAPROSOSTHENIA GREDLERI (NEUMAYR)

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The United States National Museum has recently received a lot of specimens of this species from its type locality, Lake Er-Hai, near Tali-Fu, Yunnan, China (Plate 6, Figures 6–9). This species is a near relative of the fossil genotype *P. minuta* Annandale, and we feel that a notice of its anatomic characters heretofore unknown are important in assigning it to its proper supergeneric position.

The taxonomic vicissitudes of the species may be epitomized as follows:

1883 *Diana gredleri* Neumayr, Neues Jahrb. Min., Vol. 2, p. 24 (*nomen nudum*)
1898 *Prososthenia* (?) *gredleri* Neumayr, Wiss. Ergebn. Szechenyi Reise Ostasien, Vol. 2, p. 654, pl. 4, figs. 2 and 3.
1919 *Paraprososthenia gredleri* Annandale, Rec. Geol. Surv. India, Vol. 50, pt. 3, p. 228, pl. 31, fig. 7.

There is a possibility, even a probability that

1908 *Pachydrobia monbeigi* Dautzenberg, Journ. Conchyl., Vol. 55, p. 337, pl. 4, figs. 5–7,

may prove to be a synonym of this species. Dautzenberg says that it was collected by R. P. Monbeig at Wei-Si, Yunnan.

The shell of *P. gredleri* Neumayr has been well described before and can readily be visualized by our figure. The speci-

[1] Published by permission of the Secretary of the Smithsonian Institution.

men figured (U.S.N.M. Cat. No. 433390) measures: Length 12.1 mm., diameter 4.9 mm.

The animal of *Paraprososthenia gredleri* has the eyes borne on the somewhat expanded outer bases of the elongate conic tentacles. The verge is very elongate conic, usually carried sinistrally coiled in about 1.5 turns, and is situated on the right side of the neck, above and a little behind the right tentacle. The operculum is oval, thin, corneous, and paucispiral, of about 2.5 turns.

The radula has a rather broad rachidian tooth with a blunt median basal projection. It has a long sharp central cusp flanked by two sharp lesser cusps on each side and a basal tooth near its outer basal margins. The lateral tooth is club shaped with a decided basal projection. It bears 7 teeth of which the 3rd is much stronger than the rest. The inner marginal is sigmoid and bears 7 sharp cusps. The outer marginal is less flexed and has 5 cusps.

The summation of these characters definitely places the genus in the subfamily Hydrobiinae, in the company of other Chinese Mollusca belonging to the genera *Oncomelania, Katayama, Delavaya, Tricula, Hypsobia, Taihua,* and probably several other genera that we believe may eventually prove to belong here. The fact that some of these genera serve as intermediate hosts of *Schistosoma japonicum,* the most dangerous Asiatic Trematode to human health, makes it desirable to suspect this animal as serving in a similar capacity.

ZONATION OF THE INTERTIDAL MARINE MOLLUSKS AT CAPE ANN, MASSACHUSETTS

By RALPH W. DEXTER

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Studies on the zonation of marine life were made on the shores of a tidal inlet (Annisquam River) at Cape Ann, Massachusetts, during the summers of 1935-37. Fifteen localities were selected for quantitative sampling, and during the three summer seasons, 68 series of samples between the tide lines,

including a total of 440 quadrat counts, were made. During the first year a counting frame of 400 square inches was used, while during the latter years a frame 100 square inches in area was employed for all common species, and the samples multiplied by four so that the data for all three years would be comparable and read in terms of abundance on approximately one-quarter of a square meter. In addition, random samples were taken at nine other field stations.

This paper is a special report on the zonation of the intertidal mollusks for students of malacology. A more complete study on the zonation of the biotic communities and their predominant species will be published later. For this study, nine stations have been selected to illustrate the vertical distribution of the intertidal mollusks. Selection was made to represent all of the principal types of shorelines, biotic communities, and species of mollusks, and to include ones which are typical of the zonation as found at Cape Ann in the years of 1935 and 1936. They were also selected in rough proportion to the occurrence of the various kinds of intertidal communities. In each case an average has been made of two series of samples taken during the same season, except where the tide did not permit a study of the lowest levels. In those quadrats the abundance is based upon a single sample.

In the tables, the number of each column is the quadrat number, which is briefly described at the head of the table, and its distance from the preceding quadrat level is stated. Notations on the nature of the substratum or vegetation hold for succeeding quadrats until another notation is given. Symbols used in the tables are as follows: D = downshore distance in feet, measured along the ground; L = vertical distance lower, measured in inches; S = bivalve seed; Y = young individuals; S. H. W. L. = spring high-water-line. Counts = abundance per 400 square inches or approximately ¼ square meter.

Some of the well known studies in intertidal zonation, including measurements on molluscan populations, have been published by Huntsman (1918), Gowenlock and Hayes (1926), Fischer (1929), Stephen 1929/1930), Elmhirst (1932), Coleman (1933), Gardiner (1934), Kitching (1935), Hewatt (1937), Moore (1940), and Brady (1943).

From a study of the tables presented here, it is evident that certain species are associated with a definite tidal level and a particular type of substratum or vegetation, which are often characterized by their molluscan populations. In general, the greater the vertical distance included in the series of samples, the more species will be found, and they will exhibit a more precise zonation. As many as nine species have been found in a single series. The high marshes of *Spartina patens*, located for the most part above mean high-water-line, is the only important habitat of *Melampus bidentatus*. The marshes of *S. glabra*, extending for several feet below mean high-water-line, are inhabited by *Modiolus demissus* and *Littorina saxatilis*. When seaweeds are present among the thatch grass, *L. obtusata* is another characteristic member of this zone. *L. saxatilis* is also located on the high and middle rocky shores. Seaweeds attached to the rocks of the middle shore abound with *L. obtusata* which simulates the color of the algae on which it is found. On soft muds of the middle and lower shores will be found *Ilyanassa obsoleta*. In the less silty muds and sands of the middle and lower shores are *Mya arenaria, Macoma balthica, Solemya velum*, and *Ensis directus*. Either in or on the sediments, *Polinices heros* is to be found, although at low water many individuals of this species leave the intertidal zone while following down the tide. On the muds and moist sands are *Gemma gemma* and *Rissoa aculeus*, especially under drifted-in seaweeds such as *Chaetomorpha linum* or *Ulva lactuca*. In the muds of the lower shore, *Petricola pholadiformis* is to be found, while pure sand of the lower shore is characterized by *Siliqua costata*. The middle and lower rocky shores contain *Thais lapillus*, especially when the rock barnacles *Balanus balanoides* are present. The lower rocky shores are characterized by *Acmaea testudinalis* and *Crepidula fornicata*. *L. saxatilis* and *M. arenaria* were often found out of their usual zones during the season of 1935 because of a sudden increase in abundance. Some other species likewise underwent a pronounced change in abundance, and a few are more abundant or widely distributed than the selected tables presented here would indicate. These matters have been discussed earlier (Dexter 1944).

Only *L. littorea* was found to be ubiquitous. It is common on all shores, but usually avoids very soft mud and loose, dry sand. At such places, if found at all, it adheres to shells, stones and other scattered solid objects. A report on the local movements of this species and of *T. lapillus* has been published (Dexter 1943). Of the 21 species recorded in the 9 tables presented here, *L. littorea* is listed in 8 of them. Eleven species are recorded for the following number of times: *M. edulis, M. arenaria* 6 times; *L. saxatilis, L. obtusata* 5 times; *M. balthica* 4 times; *P. heros* 3 times; *S. velum, G. gemma, E. directus, T. lapillus, A. testudinalis* 2 times. Nine species are recorded but once. The following species are found to continue below the intertidal zone: *A. tesudinalis, P. heros, C. fornicata, L. littorea, N. trivittata, Anomia aculeata* (the preceding two were found to be almost entirely subtidal), *M. edulis, G. gemma,* and *M. arenaria* seed.

The rather definite zonation of intertidal mollusks is the result of several factors. The required duration or frequency (Fischer 1929) of submergence by seawater, the degree of resistance to unfavorable conditions by different species (Gowenlock and Hayes 1926), and habitat preference as to the nature of the substratum and type of vegetation are all important in determining vertical distribution.

Table I. Station J. High marsh, low marsh, and mud flat. Average sample of July 27 and August 24, 1935. Quadrat nos. 8–11 for July 27 only. (1.) Marsh of *Spartina patens,* near S. H. W. L. (2.) 21 D, 4 L. (3.) 21 D, 1.5 L. (4.) 26 D, 1.5 L. (5.) 40 D, 4.5 L. Marsh of *S. glabra.* (6.) 14 D, 52 L. (7.) 21 D, 25 L. Soft, black, sticky mud (8.) 21 D, 7 L. (9.) 21 D, 1 L. (10.) 20 D, 2 L. (11.) 20 D, 3 L. near L. W. L.

	1	2	3	4	5	6	7	8	9	10	11
Melampus bidentatus		36	86	53							
Littorina saxatilis		1		4	350	30	1			1	1
L. obtusata					1						
Modiolus demissus					1	20					
L. littorea					30	185	3				
Mytilus edulis (seed)						4	1				
Ilyanassa obsolcta						2	33	54	40	40	61
Mya arenaria							2	3		1	
Macoma balthica							1	1		5	2

TABLE II. Station Q. High marsh, low marsh, and mud flat. Average sample of July 13 and August 21, 1935. (1.) Marsh of *Spartina patens* near M. H. W. L. (2.) 12 D, 35.5 L. Marsh of *S. glabra*, with *Fucus vesiculosus*. (3.) 12 D, 22 L. Firm, sandy mud. (4.) 40 D, 8.5 L. (5.) 26 D, 5.5 L. (6.) 16 D, 3 L. Soft, black mud. (7.) 16 D, 6.5 L.

	1	2	3	4	5	6	7
Littorina obtusata	1	8					
L. littorea	35	81	8	3			
Mytilus edulis (seed)		1	38	9			
Macoma balthica			28	46	13	3	1
Mya arenaria			22y	10y	5y		
			198s	754s	772s	256s	3s
Solemya velum				1		1	3
Polinices heros					1	1	

TABLE III. Station N. Low marsh and mud flat. Average sample of August 10 and September 11, 1936. (1.) Marsh of *Spartina glabra with Ascophyllum nodosum f. scorpioides*, near M. H. W. L. (2) 25 D, 30.5 L. (3.) 6 D, 27 L. Sandy mud covered with *Chaetomorpha linum*. (4.) 26 D, 11 L. Soft mud. (5.) 31 D, 3.5 L. (6.) Mud covered with *C. linum*. (7.) 16 D, 2 L.

	1	2	3	4	5	6	7
Littorina obtusata	30						
L. saxatilis	30	42					
L. littorea	164	158	108	12	8	2	2
Mytilus edulis		24s	18s			30s	8s
Polinices heros			4		2		
Mya arenaria			10y	2y			
			16s	2s	1s		
Gemma gemma			68		26	20	8
Rissoa aculeus			16	280	74	4	2
Macoma balthica					6		

TABLE IV. Station G. Sandy-mud bar. Average sample of July 4 and August 117, 1935. (1.) Near top of bar. (2.) 40 D, 7 L. (3.) 30 D, 5 L. (4.) 22 D, 7 L. (5.) 22 D, 5 L. (6.) 22 D, 10.5 L. Near S. L. W. L.

	1	2	3	4	5	6
Macoma balthica	23	23	19	17	1	
Mya arenaria	124y	130y	180y	86y	17y	
	358s	340s	600s	346s	3s	1s
Polinices heros						1
Littorina littorea						1
Petricola pholadiformis						1
Ensis directus						1

Table V. Station S. Sand bar. Average sample of July 10 and July 17, 1936. (1.) Top of bar. (2.) 16 D, 7 L. (3.) 16 D, 4 L. (4.) 21 D, 3 L. (5.) 21 D, 3.5 L. (6.) 21 D, 2 L. (7.) 21 D, 2.5 L. (8.) 21 D, 1 L.

	1	2	3	4	5	6	7	8
Ensis directus	2		2					
Gemma gemma	16	14	4		4	2	2	
Solemya velum			2	2	6	2	2	8
Siliqua costata								2

Table VI. Station W. Sandy beach. Average sample of July 23 and August 22, 1935. No mollusks were found in quadrats 1–3, 10, (Dry, loose sand,) 17–18, (Hard, wet sand). (4.) 80 D, 22 L. from M. H. W. L. (5.) 26 D, 5.5 L. in strip of *Spartina glabra* (6.) 26 D, 4 L. in strip of firm, algal mat (7.) 26 D, 3.5 L. Firm sand (9.) 26 D, 3 L. (11.) 52 D, 13.5 L. Soft, loose sand (12.) 26 D, 6.5 L. Moist sand. (13.) 26 D, 4 L. (14–16) 26 D, 6 L. each.

	4	5	6	7	8	9	11	12	13	14	15	16
Littorina saxatilis	1	5	4									
L. littorea			9	2								
Mya arenaria			1	4	1	1	4	9	8	13	11	7

Table VII. Station E. Mussel bed. Average sample of June 23 and July 12, 1936. (1.) Rocks at base of sea-wall (2.) 16 D, 28.5 L. Edge of mussel bed (3.) 36 D, 13.5 L. (4.) 36 D, 17.5 L. (5.) 4 D, 5 L. Top of steep, sloping edge of mussel bed (6.) 2 D, 10 L. (7.) 2 D, 10 L. Near S. L. W. L.

	1	2	3	4	5	6	7
Littorina littorea	32	28	8	42	14	8	16
Mytilus edulis		182	308	344	342	106	32
		710s	440s	70s	156s	16s	
Nassarius trivittatus				2			

TABLE VIII. Station T. Rocky shore at edge of high marsh. Average sample of July 24 and August 13, 1935. Quadrat no. 8 for July 24 only. (1.) Marsh of *Spartina patens*, near M. H. W. L. (2.) 10 D, 6.5 L. (3.) 16 D, 24 L. Gravel bank of *Salicornia europea*. (4.) 6 D, 9 L. Small stones with *Fucus vesiculosus* (5.) 4 D, 9 L. Large boulders with *Ascophyllum nodosum* (6.) 4 D, 16.5 L. (7.) 4 D, 13.5 L. (8.) 4 D, 15.5 L.

	1	2	3	4	5	6	7	8
Littorina littorea	8	32	40	38	14	8	52	80
L. saxatilis		4	4					
L. obtusata				80	132	70	60	40
Mytilus edulis						4	12	
						1000s	150s	2800s
Acmaea testudinalis							6	
Thais lapillus							16	12

TABLE IX. Station B. Rocky shore at junction of inlet and Gloucester Harbor. Average sample of August 19 and September 3, 1935. Quadrat no. 10 for August 19 only. (1.) Gravel bank at foot of sea-wall (2.) 30 D, 42 L. Edge of small rocks (3.) 20 D, 4 L. *Fucus vesiculosus* on rocks. (4.) 50 D, 6.5 L. Edge of large rocks with *F. vesiculosus* and *Ascophyllum nodosum*. (5.) 21 D, 0 L. (6.) 21 D, 3.5 L. Large boulders with *A. nodosum*. (7.) 21 D, 6.5 L. (8.) 15 D, 7 L. (9.) 15 D, 4 L. (10.) 15 D, 6 L. Near S. L. W. L., no seaweeds.

	1	2	3	4	5	6	7	8	9	10
Littorina saxatilis	1	6	64	28	2	8				
L. littorea	1	29	575	520	172	100	182	336	210	100
Mytilus edulis			6	34	26	34	8			
Mya arenaria (seed)			20	30	12		2			4
L. obtusata					128	39	88	42	20	
Thais lapillus					18	2	4	18	4	
Acmaea testudinalis								2	4	
Anomia aculeata									4	
Crepidula fornicata									2	12
										40y

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DESCRIPTION OF A NEW TEINOSTOMA

By THOMAS L. McGINTY

Teinostoma pilsbryi new species.

The shell is solid, white, with a low dome-shaped spire and less convex base, the periphery bluntly angular, the basal callus extremely thick, drop-like; sculpture of rather coarse spirals. There are 3½ whorls, the first 1⅔ convex and smooth, the follow-

ing flatter. Last whorl having sculpture of many low spirals wider than their intervals, slightly waved, rather coarse on the upper surface, finer and weaker on the base. The umbilical callus rises abruptly and is very thick. The aperture is subtriangular, with rounded angles. Parietal callus is heavy in the upper angle of the mouth. Diameter 2.15 mm., height 1.4 mm.

Localities: One and one-half miles off Cape Florida, in 70 feet (J. A. Weber). Type 181080 A.N.S.P. Paratypes from Lake Worth at North Inlet (Palm Beach), Florida (T. L. M.).

The type of this species is a dead shell which has lost the outer layer of the shell over a considerable area, including the front of the last whorl, which therefore appears smooth. But it has other strongly distinctive features additional to the spiral striation. The periphery is distinctly, though bluntly, angular, and the umbilical callus is extremely thick, like a drop of water on a dry surface, being abruptly limited.

This interesting *Teinostoma* is quite unlike any other described. I take pleasure in naming it for Dr. H. A. Pilsbry. It will be figured in the next number of NAUTILUS.

NOTES AND NEWS

NON-CHONCHOLOGICAL SYNONYMY.—In the travelogue of my trip to Great Slave Lake which appeared in the January, 1945, number of this journal, a new name "Shyes" is proposed in the middle of p. 76. This is an arbitrary combination of letters, coined by the printer, editor or author, or perhaps by all three in an uneasy alliance. Unfortunately the original name "Schney" (vide p. 96, Preble, 1908) has precedence and must be applied. The word is the anglicized form of the French "chenal" and is used to describe a narrow channel in a delta.—JOHN OUGHTON.

CYPRAEIDAE FROM ESPIRITU SANTO ISLAND, NEW HEBRIDES.—The following nineteen species were collected on Espiritu Santo Island proper, one of the New Hebrides Islands, in 1944. The listing of them here adds specific locality data to the literature of the Cypraeidae from the New Hebrides.

Cypraea annulus Linnaeus
Cypraea asellus Linnaeus
Cypraea caputserpentis Linnaeus
Cypraea carneola Linnaeus
Cypraea errones Linnaeus
Cypraea fimbriata Gmelin
Cypraea helvola Linnaeus
Cypraea hirundo Linnaeus
Cypraea isabella Linnaeus
Cypraea lynx Linnaeus
Cypraea mauritiana Linnaeus
Cypraea moneta Linnaeus
Cypraea neglecta Sowerby
Cypraea vitellus Linnaeus
Nuclearia nucleus (Linnaeus)
Nuclearia limacina (Lamarck)
Pustularia cicercula (Linnaeus)
Pustularia annulata (Gray)
Ipsa childreni (Gray)

—William Marcus Ingram and Karl W. Kenyon.

Tridacna.—I am in receipt of a letter from Martin Anthony Brunor of New York and Tahiti who states, among other things: "On my last trip I brough back with me 600 Tridacna shells and was able to sell then within six months, after I landed, but when I tried to study them, down in the South Seas, I had a hard job as I couldn't keep them alive very long. To think that such a powerful mollusk should be so delicate and die within 12 hours, after its removal from its environment, surprises me. I tried as best I could, to duplicate its habitat, but was not successful. These clams interest me very must as I like to eat certain portions of them and they have proved very profitable for me."—Paul Bartsch.

Erratum.—Owing to a typographical error, the name *Acmaea cona* appeared as the name of a new species in Descriptions of New Species of *Acmaea*, by A. R. (G.) Test, in the Nautilus page 92. This should have been *Acmaea conus*, the only form in which this Latin noun could be used.—Avery R. (G.) Test.

Radix auricularia (Linn.) in Vermont.—During September of 1944, Mr. James R. Miller found *Radix auricularia* very

abundant in the Wallomsie River, near the Bennington battle monument, at Shaftsbury, Vermont. This is thought to be the first record of this introduced species in Vermont.—RICHARD I. JOHNSON.

TELLINA PANAMANENSIS Li.—A superfluous new name was proposed for this species owing to a mistaken belief that Li's name was homonymous with *Tellina panamensis* Philippi, 1848. The references now stand:

Tellina panamanensis Li, 1930, Bull. Geol. Soc. China 9:262, pl. 5, fig. 32.—Pilsbry, 1931, Proc. Acad. Nat. Sci. Phila. 83:436, pl. 41, figs. 4–6.—Pilsbry & Olsson, 1941, op. cit. 93:68.
Tellina liana Hertlein & Strong, 1945, Nautilus 58:105.
Tellina panamensis Li, Hertlein & Strong, 1945, Nautilus 58: 105.

The name "*Tellina panamensis* Li" originated with Hertlein & Strong. Since Mr. Li wrote "*panamanensis*" when describing the species, and also in the explanation of his plate, p. 290, and on the label of his type specimen, his use of that form was evidently intentional, and the species has entered subsequent literature under that name. Owing to absence in Florida during the winter, this was not seen in time to take the matter up with my West Coast friends before their publication.—PILSBRY.

PUBLICATIONS RECEIVED

THE CONTROL OF BILHARZIA IN SOUTHERN RHODESIA, by Alan Mozley, D.Sc. (Edin.) Salisbury, Southern Rhodesia, 1944, 307 pp.—*Bilharzia* is another name for Schistosomiasis, the disease caused by the parasite, *Schistosoma,* which lives some weeks in certain water snails on its way from man back to man again. Hence the propriety of getting a malacologist with the wide experience of Alan Mozley to study the problem of control of this disease common to snail and man. Sound scientific work through 1939-42 over thousands of localities and in a laboratory built for experiments has convinced him that in Rhodesia the best way to combat the disease is to kill the snails. This he claims can be done effectually and cheaply by several means,

amongst which is the use of certain native plants, but especially the use of a cheap native mineral, malachite, containing carbonate of copper, which used in very small amounts quickly kills the snails, and does not harm man.

A land elevated two to five thousand feet, with little limestone and periods of flood and drought, proves ill adapted for water mollusks and only about 18 kinds are listed, of which about half are pulmonates including the two that, with man, are hosts of the dangerous schistosomas. One, *Biomphalaria pfeifferi* (Krauss), formerly *Planorbis,* is the intermediary host of *Schistosoma mansoni* which infests the human intestines, and the other is *Physopsis globosa* (Krauss) which harbors *Schistosoma haematobium* that causes urinary bilharzia.

These two snails derived anciently from gill-breathing marine ancestors later came into fresh water from a lung-breathing land phase, and one of them, *Physopsis,* has developed a secondary gill. They belong rather to northern than to tropical environments and are to be regarded somewhat as interlopers. But does this ease the qualms of a malacologist at attempting to exterminate them? If Mozley's recommendations are put into effect the advance of that country may be greatly accelerated, while these two species of pulmonates may be nearly or quite eliminated. But before then we hope plenty of specimens will be studied and preserved so that in time we may find out just why these two species of *Schistosoma* picked on precisely these two species of snails.—E. A. Andrews.

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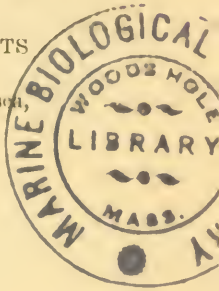

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A QUARTERLY
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